Ground-Water Monitoring Compliance Projects for Hanford Site Facilities

Progress Report for the Period January 1 to March 31, 1987

Volume 1: The Report

PNL--6467-Vol.1

DE88 007367

May 1987

**Prepared by the
Pacific Northwest Laboratory
and Rockwell Hanford Operations
for the
U.S. Department of Energy
Richland Operations Office**

GROUND-WATER MONITORING COMPLIANCE PROJECTS
FOR HANFORD SITE FACILITIES

PROGRESS REPORT
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SUMMARY

This report documents the progress of four Hanford Site ground-water monitoring projects for the time period from January 1 to March 31, 1987. The four disposal facilities are: the 300 Area Process Trenches, the 183-H Solar Evaporation Basins, the 200 Area Low-Level Burial Grounds, and the Nonradioactive Dangerous Waste (NRDW) Landfill. This report is the third in a series of periodic status reports; the first two cover the time periods May 1 to September 30, 1986, and October 1 to December 31, 1986. This report satisfies the requirements of section 17B(3) of the Consent Agreement and Compliance Order.

The four ground-water monitoring projects discussed in this report have been designed according to the applicable ground-water monitoring requirements specified in the Resource Conservation and Recovery Act (RCRA), 40 CFR 265.90 [U.S. Environmental Protection Agency (USEPA) 1984], and in WAC 173-303-400 of Washington State's regulations (Washington State Department of Ecology 1986).

During this reporting period, the 300 Area, 183-H, and NRDW Landfill projects completed all monitoring wells that were part of the initial drilling phase and incorporated them into the ground-water monitoring networks for each site. Characterization reports have been drafted for the three projects and will be released to the State and USEPA in the next quarter. The 200 Area project has been delayed because of the lack of bids for drilling contracts. No drilling contracts have been awarded for this project during the reporting period, but progress has been made. Contracts for drilling in the 200-West and 200-East Areas are expected to be awarded in the next quarter.

Analytical results for the three sites for which wells have been drilled produced no deviations from the established trends. Results from the NRDW Landfill indicate that the facility has not impacted the ground-water quality in the area. Fluctuations in concentrations of specific parameters at the 300 Area site are generally attributed to specific known activities conducted in the area. Fluctuations in specific parameter concentrations in wells in the vicinity of the 183-H facility are attributed to water table fluctuations associated with river stage.

Phase III drilling plans for the 183-H project were finalized following discussions with representatives of the Washington State Department of Ecology. A major decision affecting these plans was to conduct chromium plume assessment for the area under ongoing RCRA Corrective Action and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial investigation studies that will be initiated in the near future. Three additional wells will be drilled during Phase III. Additional hydrologic testing and well development will also be performed during this time.

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INTRODUCTION

This report covers recent progress on ground-water monitoring projects for four Hanford Site facilities: the 300 Area Process Trenches, the 183-H Solar Evaporation Basins, the 200 Area Low-Level Burial Grounds, and the Nonradioactive Dangerous Waste (NRDW) Landfill. This report documents the progress of the four projects in the time period from January 1 to March 31, 1987. The four ground-water monitoring projects were designed according to the applicable ground-water monitoring requirements contained in the Resource Conservation and Recovery Act (RCRA), 40 CFR 265.90 [U.S. Environmental Protection Agency (USEPA) 1984], and in WAC 173-303 of Washington State's regulations (Washington State Department of Ecology 1986). Draft interim characterization reports for all projects except the 200 Area Low-Level Burial Grounds have either been completed and are in technical review or are in the final stages of completion. Drilling is expected to begin soon at the 200 Area Low-Level Burial Grounds.

Detailed plans for these four monitoring projects have been provided in separate documents (USDOE 1986a, d, e, f). For preparation of this document, it was assumed that the reader would have a basic knowledge of the projects.

This report is the third in a series of periodic progress reports. The previous reports (USDOE 1986c and 1987) covered the time period from May 1 to December 30, 1986.

This report contains a chapter for each of the four projects. In general, each chapter is divided into two sections: drilling and hydrogeologic characterization and routine sampling and analysis of the ground water. Raw data and some limited interpretive remarks are included. Interpretations should be considered preliminary pending collection of additional periodic ground-water monitoring data and additional time to evaluate the existing data. Detailed interpretations, with illustrative figures such as geologic cross-sections and water table maps, will be contained in the characterization reports. Supporting information for this report is included in the appendices.

300 AREA PROCESS TRENCHES

Previously issued reports (USDOE 1986c, f; 1987) contain information on the progress made and the data obtained by the RCRA Compliance Ground-Water Monitoring Project for the 300 Area Process Trenches during the time period from June 1985 through December 31, 1986. This report includes information on subsequent activities and data.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

All 17 new monitoring wells were completed and an additional observation well was added to well cluster 399-1-16 to obtain hydrologic data only. The last of the 17 new monitoring wells was completed on February 12, 1987. Monitoring well construction activities, aquifer testing, hydrogeologic data collection, and analysis activities are discussed in the following paragraphs. Inspection lists, well construction summaries, water level data, and geologists', geophysical, and construction logs for these new wells are contained in Appendix A of Volume 2.

Well Drilling Effort

The five remaining cluster wells were completed during the reporting period. The locations of all wells currently in the 300 Area Process Trenches Monitoring Network are shown in Figure 1. A summary of well completion information is presented in Table 1. Two of these wells were completed as intermediate wells (399-1-16B and 399-1-18B) screened in the middle member of the Ringold Formation, which is just above the bottom of the unconfined aquifer. The other three (399-1-16C, 399-1-17C, and 399-1-18C) were completed as deep wells screened in the basal member of the Ringold Formation, which is just above the top of the basalt.

One single well, 399-1-9, was completed as a deep well screened in the basal member of the Ringold Formation. Underlying the Ringold Formation in this well is the Ice Harbor member of the Saddle Mountains Basalt. The Martindale flow within the Ice Harbor member was positively identifed through chemical analysis of portions of the sample collected from the 179-to-180-ft depth interval. The same results were obtained for samples from the bottom of deep

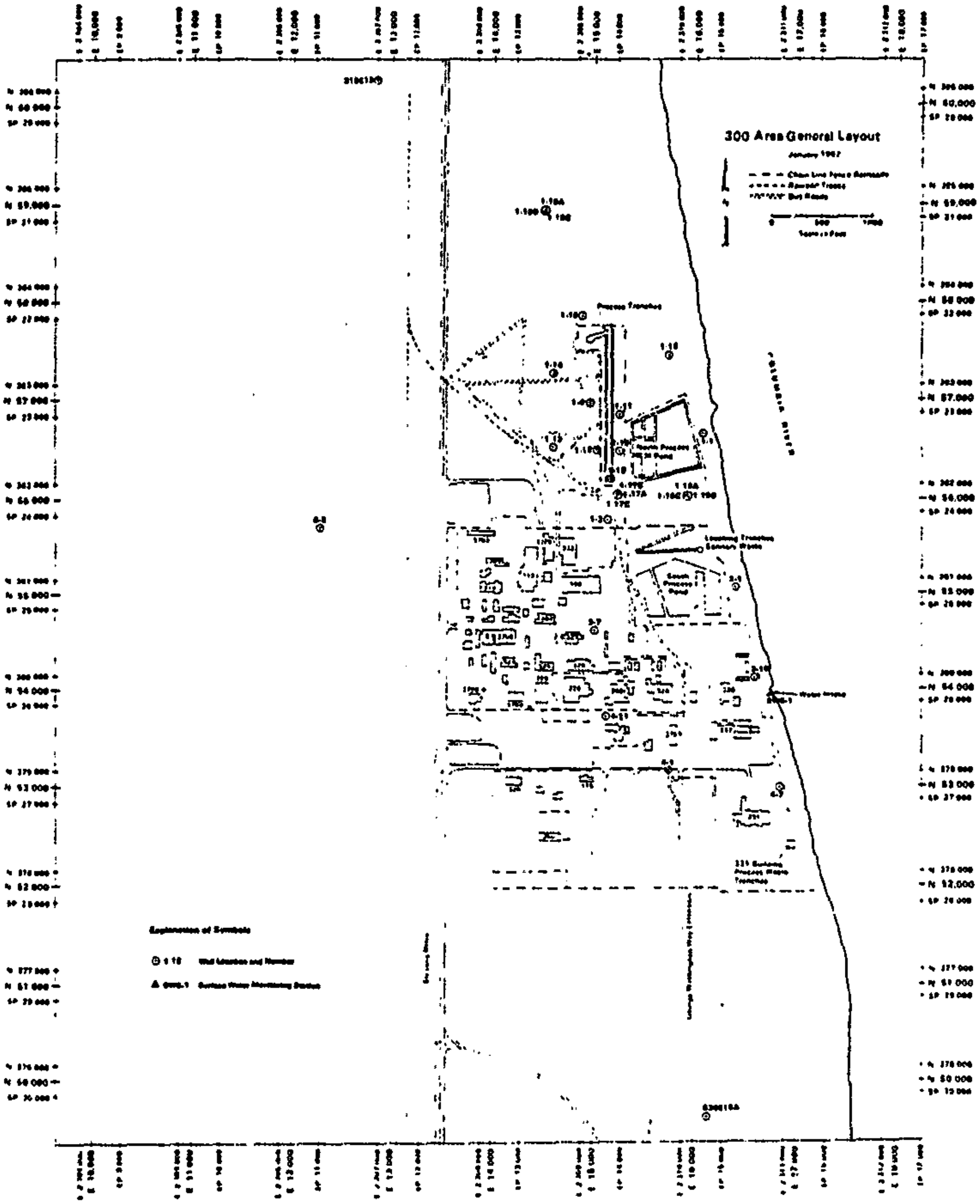

FIGURE 1. Location of 300 Area RCRA Monitoring Wells

TABLE 1. Summary of Completion Information for Wells Installed in the 300 Area During the Period from June 23, 1986, Through February 12, 1987

Permanent Well Number	Completion Date	Drilled Depth[a]	Depth to Bottom[a]	Initial Depth to Water[a]	Depth to Ringold Contact[a]	Depth of Screened Interval[a]
399-1-9	2-12-87	181'	180'	42.9'	52'	170'-180'
399-1-10	12-1-86	45'	39.5'	29'	27'	24.5'-39.5'
399-1-11	11-20-86	47'	47'	37'	42'	27'-47'
399-1-12	11-3-86	65'	60'	39.1'	47'	45'-60'
399-1-13	11-5-86	56'	53'	43'	52'	38'-53'
399-1-14	11-14-86	50'	46'	36.5'	47'	31'-46'
399-1-15	11-7-86	48'	44'	33.3'	45'	29'-44'
399-1-16A	12-5-86	48'	47.5'	37.3'	32'	32.5'-47.5'
399-1-16B	2-10-87	118'	115'	37.9'	32'	105'-115'
399-1-16C	1-16-87	178'	177.5'	39'	32'	167.5'-177.5'
399-1-16D	1-29-87	180'	116'	40.5'	35'	106'-116'
399-1-17A	11-13-86	41'	40'	31.9'	30'	25'-40'
399-1-17B	12-19-86	115'	110'	32.9'	38'	100'-110'
399-1-17C	1-16-87	173'	171'	33'	38'	161'-171'
399-1-18A	11-12-86	63'	54'	44.2'	40'	39'-54'
399-1-18B	1-23-87	125'	118'	45.5'	39'	108'-118'
399-1-18C	1-6-87	153'	140'	42.8	38'	130'-140'
399-1-19	5-23-86	45'	45'	31'	40'	35'-45'
399-4-11	11-26-86	95'	70'	59.9'	87'	55'-70'

(a) All depths are given relative to land surface.

wells 399-1-16C and 399-1-17C; however, the chemistry of rock samples from well 399-1-18C revealed that a younger basalt flow, the Goose Island, was present at the northern edge of the 300 Area. The sample of basalt was taken from a depth of 145 to 150 ft, which is 25 to 35 ft shallower than the other deep wells. The Goose Island basalt flow overlies the Martindale basalt flow. Water level and aquifer test data indicate that materials overlying the Goose Island flow are hydraulically connected to the intermediate (unconfined) zone; materials overlying the Martindale flow contain ground water that is hydraulically separate from the unconfined aquifer.

Difficulties during pullback of the temporary well casing from well 399-1-16D (C1C, a temporary number) necessitated replacement with a new monitoring well 399-1-16C (C1D). Monitoring well 399-1-16D was originally planned as a deep monitoring well. Drilling of 399-1-16D with continuously driven, 10-in.-diameter, steel casing began in late September 1986 and was completed by mid-October to 180 ft in depth. The temporary steel casing was pulled back only a few inches when the casing broke and separated a few inches at the break. With some difficulty, the stainless-steel casing, well screen, and sand pack were removed. The 10-in. casing was inspected in December with a caliper log (a device designed to measure the diameter of the well bore and casing) to determine the location of the break. Based on the caliper log, the break or a break was at 114 ft in depth; therefore, the well could be completed as an intermediate-depth well. The downhole television camera was not operational, and therefore it could not be used to ascertain if the caliper log interpretation was accurate.

A decision was reached to complete the deep well as an intermediate-depth well to 116 ft. The 10-in. steel casing was perforated every foot from 180 to 114 ft, then grouted with Volclay, a bentonite grout, to a depth of 116 ft to seal off the confined aquifer below. In the meantime, well 399-1-18C (C1B), which was originally to be completed as the intermediate-depth well, was being completed to a depth of 180 ft to serve as the replacement well for monitoring the confined aquifer. During the completion of 399-1-16D as an intermediate-depth well in late January 1987, it was suspected that the original depth of the break was incorrect, or that a second break might be present at about 95 ft. The shallower break was confirmed. This second break meant that only 2 or 3 ft of the 10 ft of well screen were exposed to the formation and only indirectly through the perforated casing (114-116 ft) and the break identified by the caliper log (113.5 to 114 ft). Because of the limited interval open to the formation, use of this well was limited to observation during aquifer testing and for water level measurements. A replacement well, 399-1-16C (C1D), was constructed to obtain chemistry data and aquifer test data.

Hydrogeologic Characterization Effort

Between November 5, 1986, and March 5, 1987, thirteen 300 Area wells were tested to determine aquifer properties. All but one of the wells tested were drilled for the 300 Area RCRA project. All wells were pumped at a constant-discharge rate and water levels were observed during both the drawdown and recovery portions of the tests. Eight wells were tested during the first quarter of 1987. Wells 399-1-10, 399-1-13, 399-1-14, and 399-1-18A were pump tested at approximately 600 gallons per minute (gpm). Transmissivity values were calculated to be approximately 100,000 ft^2/day from testing well 399-1-13 and 200,000 ft^2/day from testing well 399-1-14 (based on data from both wells that were not corrected for partial penetration). Transmissivity values were approximately 700,000 ft^2/day and 150,000 ft^2/day calculated from tests conducted on wells 399-1-18A and 399-1-10, respectively. Data collected from well 399-1-10 were affected by the Columbia River.

Tests were conducted in two other shallow wells besides those mentioned above. Well 399-1-16A was, apparently, screened in the upper part of the Ringold Formation and the static water level was over 6 ft deeper than the Ringold-Hanford contact. This well was pumped at 30 gpm for 180 min. Well 399-1-3 is an older well, drilled in 1950, and is perforated in both the Hanford and Ringold Formations, at 25 to 44 ft and 54 to 70 ft below land surface datum (lsd). This well was pumped at approximately 230 gpm for 24 hours. Although observation wells were monitored during both tests, the water levels were either not affected by pumping or were masked by river effects. A transmissivity could be calculated from pumping well 399-1-16A- approximately 10,000 ft^2/day. No transmissivity could be determined from pumping 399-1-3, because of the fluctuation of the discharge rate and, consequently, that of the observed water levels.

Seven more aquifer tests were conducted on wells drilled to intermediate depths (just above the confining clay layer of the Ringold Formation) and deeper depths (between the clay layer and the underlying basalt). Eight-hour pumping tests were used to determine the aquifer characteristics of the intermediate wells 399-1-17B and 399-1-18B, and the deep wells 399-1-16C, 399-1-17C, 399-1-18C, and 399-1-9. A 13-hour and a 5-hour pumping test were conducted on the intermediate-depth well 399-1-16B.

Transmissivities calculated from the tests indicated values of approximately 30 ft^2/day for well 399-1-17B, 8 ft^2/day for well 399-1-18B, 6 ft^2/day for well 399-1-16C, 70 ft^2/day for well 399-1-17C, 9 ft^2/day for well 399-1-18C, and 1.5 ft^2/day for well 399-1-9. Observation wells that were measured during these tests were drilled to different levels and showed only small effects from the pumped well. However, both well 399-1-18B and 399-1-18C showed very similar characteristics, including specific capacities, heads, and transmissivities. These wells were completed in very similar parts of the Ringold Formation, where the clay layer is thin and may not be as effective in preventing vertical leakage as is the case in other wells tested in the 300 Area.

Well 399-1-16B was pumped for over 8-hours because well 399-1-16D was completed in the same zone and could be used as an observation well. The other wells in the cluster, although monitored for changes in head during pumping, never reacted to the pumping of 399-1-16B. Well 399-1-16D did react to pumping, and water levels were drawn down over 3.5 ft during the second aquifer test (pumped at 20 gpm). Transmissivity for well 399-1-16B was calculated to be 20 to 60 ft^2/day. The transmissivity of the observation well, 399-1-16D, was 150 to 200 ft^2/day, which may be more realistic for both wells because of the extra drawdown in the pumped well caused by partial penetration and borehole effects. The river was also a factor in the testing of this well, since recharge effects were apparent later in the tests. A storativity was calculated from the Theis curve match of both test #1 and test #2; the result was an S of 0.008.

Non-routine field data collection is complete, but evaluation of geologic and hydrostratigraphic data is continuing. Work has included not only defining or redefining the geologic contact between the Hanford formation and the Ringold Formation, but also differentiating between the middle, lower, and basal members of the Ringold Formation for the first time. Upgrading

9 2 1 2 5 6 3 0 1 4 4

hydrostratigraphic interpretation of older monitoring well records required the examination of old drill cuttings stored at the core library in the 2101-M building in the 200-East Area.

The surface-water monitoring station on the Columbia River (SWS-1), which is shown on Figure 1, is adjacent to the 300 Area water intake and furnishes records of water level fluctuations in the river. The data logger has been collecting data since mid-January. In addition, two data loggers were installed in wells 399-1-10 and 399-1-16A. Timeliness of this installation was important because the remaining aquifer tests started shortly thereafter, and the influence of the river proved to be significant on the results of some of the aquifer tests. To evaluate how far inland river water actually migrates, conductivity meters and temperature probes will be connected to the existing 3-channel data loggers in three monitoring wells near the Columbia River. Three sets of these loggers will be installed late in April or in early May. Also, two more water level data loggers will be installed in wells 399-1-17A and 399-1-13 by mid-April.

A two-dimensional cross-section model was applied to the unconfined aquifer beneath the 300 Area. Steady-state simulations were performed to investigate the importance of vertical flow in the unconfined aquifer. Results showed that the ground-water flow is predominantly horizontal. It was decided to use a three-dimensional, layered system to represent the unconfined aquifer after reviewing results from the cross-section model and data from the geologic characterization task. The top of the Ringold clays will define the base of the aquifer in the layered model. The top layer will represent the glaciofluvial deposits (Hanford formation), and the bottom layer(s) will represent the Ringold Formation. The exact thicknesses of the layers are being determined.

Preliminary aquifer testing results were received and are being compared with transmissivity data used by Lindberg and Bond (1979). Discharge data were obtained for the Process Trenches and sanitary waste leaching trenches. The weekly discharges appear to be fairly uniform for the 1.5 years of data obtained. Historical water table elevations were reviewed and used to establish boundaries for the surface grid that will be input to the Coupled Fluid and Energy Solute Transport (CFEST) code. The grid was designed and CFEST input files are being prepared for the unconfined aquifer model.

ROUTINE SAMPLING AND ANALYSIS OF THE GROUND WATER

Routine sampling and analysis of the ground water has been conducted for the 300 Area Process Trenches on a monthly basis since June 1985. Recent activities under this effort and the results obtained are discussed in the following two sections. Raw analytical data for ground-water samples collected from wells in the 300 Area are contained in Appendix B in Volume 2.

Collection and Analysis

Monthly sampling of the 16 wells originally in the monitoring network continued throughout the quarter with several exceptions: wells 399-1-7 and 399-1-3 were not sampled in January because of drilling activity in the area that prevented access to the wells. During February, nine new wells were fitted with dedicated, Hydrostar[*] piston-type sampling pumps, bringing the total number of wells in the monitoring network ready for sampling to 25. Sample preparation for 30 wells was completed in February, but only 25 monitoring wells were sampled because of delays in installation of five of the pumps. All of the 18 new wells were ready for inclusion in the monitoring network in March. These wells bring the total number of monitoring wells in the RCRA monitoring network to 34 as outlined in the Compliance Plan (USDOE 1986f). Sample preparation for the 34 monitoring wells was completed in March, and all 34 monitoring wells were sampled. The results of the March sampling will be presented in the next quarterly report.

Activities under the Collection and Analysis Task during this quarter included preparing graphs, tables, and narrative descriptions for the monthly report and the interim characterization report. Work was performed on developing statistical sampling methods to reduce the costs of data verification while maintaining quality assurance.

* The Hydrostar pump is a product of Instrumentation Northwest, Inc., of Redmond, Washington.

Analyses of field samples by an independent laboratory confirmed the results from U.S. Testing (UST). Work continued on adding new blind standards to existing samples. Protocols were written for Quality Control (QC) standards and proper calibration ranges were chosen for analyses. The production of labels for QC samples was converted to the computer by the end of March. Work will continue next quarter on automating interlaboratory comparisons.

Discussion of Results

Analytical data obtained from samples collected in the 300 Area between December 1986 and February 1987 are included in this report and discussed in the following paragraphs. Results for samples collected in March 1987, near the end of the reporting period, will be included in the next progress report.

The results of sample analyses during the reporting period were generally consistent with those reported previously. Some of the data are discussed in detail below and are also shown on plots presented later in this section. Several new wells have been added to the monitoring network and the first analyses for these wells were reported in February. For plotting purposes, the wells have been split into three groups. The first group consists of those wells immediately adjacent to the trenches. The second group consists of wells near the trenches and the third group is composed of wells that are distant from the trenches. The plotting symbols are the third part of the well name for all wells starting with "3-1", the second and third part of the well name for others that start with "3-1", and a short abbreviation for the 699 wells as follows:

Adjacent	Near	Distant
3-1-4 = 4	3-1-1 = 1	3-2-1 = 21
3-1-5 = 5	3-1-2 = 2	3-1-18A = 18A
3-1-11 = 11	3-1-3 = 3	3-3-7 = 37
3-1-12 = 12	3-1-6 = 6	3-3-10 = 310
3-1-17A = 17A	3-1-7 = 7	3-4-1 = 41
	3-1-8 = 8	3-4-7 = 47
	3-1-10 = 10	3-4-11 = 411
	3-1-13 = 13	3-8-2 = 82
	3-1-14 = 14	6-S19-E13 = S19
	3-1-15 = 15	6-S30E15A = S30

Table 2 is a summary of all results obtained for samples collected from December 1986 through February 1987. For those constituents that were undetected during this time period, three asterisks appear in the column marked "Below Detection." Also, any constituents having at least one value above the regulatory standard or a screening limit are marked with three X's in the column labeled "Exceed."

Gross beta concentrations have generally remained below the drinking water screening limit of 50 pCi/L, which is consistent with previously reported levels. The only exception is the 113-pCi/L concentration in well 399-1-17A that was sampled for the first time in February.

Gross alpha levels reported in February for several wells increased from the previous month (Figures 2, 3, and 4). These increases may be in response to cleaning operations in the inlet weir to the trenches that began in mid-February and lasted for approximately 2 weeks. Uranium was recovered from material taken from the weir and was recycled by sending it to the feed materials production plant. All wells in the group adjacent to the trenches have experienced gross alpha levels greater than 15 pCi/L, the limit for Drinking Water Standards. Well 399-1-4 was sampled prior to the initiation of the cleaning operations and only had a small increase to 26.9 pCi/L in February from 24.9 in January. However, well 399-1-5 showed a definite increase in the concentration level to 76.8 pCi/L in February, which was over three times the January level, 24.8 pCi/L, in that well. New wells adjacent to the trenches that were sampled for the first time in February have only single values and no data for comparison. These are the results of those samples analyses with elevated alpha levels: well 399-1-11 = 156 pCi/L; 399-1-12 = 52 pCi/L; and 399-17A = 57.5 pCi/L. In the group near the trenches, only three wells have February sample analyses values over the 15 pCi/L limit. Well 399-1-3 has increased from a December level of 15.7 to 29.9 pCi/L. Well 399-1-7 increased to a concentration of 27.8 pCi/L in February from 12.6 in December; and well 399-1-8 with 5.42 in December and 5.68 in the January analysis increased to 17.3 pCi/L in February. Two new wells distant from the trenches that were sampled for the first time this reporting period and five other distant wells measured the alpha levels below Drinking Water Standards. The three distant

TABLE 2. Summary of Analytical Results for Ground-Water Samples Collected from 300 Area Wells from December 1986 through February 1987

----------Constituent List=Contamination Indicators----------

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Regulatory Limits Limit	Agency	Exceed	Full name
191	CONDUCT	UMHO	1	55	0	.			Specific conductance
199	PH		.1	55	0	.			pH
C68	TOX	PPB	100	55	54	.			Total organic halogen
C69	TOC	PPB	1000	55	55 ***	.			Total organic carbon

----------Constituent List=Drinking Water Standards----------

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Regulatory Limits Limit	Agency	Exceed	Full name
109	COLIFRM	MPN	2.2	55	50	1	EPA		Coliform bacteria
111	BETA	PCI/L	8	55	0	50	EPA	xxx	Gross beta
181	RADIUM	PCI/L	1	55	48	5	EPA		Radium
212	LOALPHA	PCI/L	4	55	3	15	EPA	xxx	Gross alpha
A06	BARIUM	PPB	6	55	0	1000	EPA		Barium
A07	CADMIUM	PPB	2	55	55 ***	10	EPA		Cadmium
A08	CHROMUM	PPB	10	55	53	50	EPA		Chromium
A10	SILVER	PPB	10	55	55 ***	50	EPA		Silver
A20	ARSENIC	PPB	5	55	55 ***	50	EPA		Arsenic
A21	MERCURY	PPB	.1	55	55 ***	2	EPA		Mercury
A22	SELENUM	PPB	5	55	55 ***	10	EPA		Selenium
A33	ENDRIN	PPB	1	25	25 ***	.2	EPA		Endrin
A34	METHLOR	PPB	1	25	25 ***	100	EPA		Methoxychlor
A35	TOXAENE	PPB	1	25	25 ***	5	EPA		Toxaphene
A36	a-BHC	PPB	1	25	25 ***	4	EPA		Alpha-BHC
A37	b-BHC	PPB	1	25	25 ***	4	EPA		Beta-BHC
A38	g-BHC	PPB	1	25	25 ***	4	EPA		Gamma-BHC
A39	d-BHC	PPB	1	25	25 ***	4	EPA		Delta-BHC
A61	LEADGF	PPB	5	53	49	50	EPA		Lead (graphite furnace)
C72	NITRATE	PPB	500	56	0	45000	EPA		Nitrate
C74	FLUORID	PPB	500	56	56 ***	1400	EPA		Fluoride
H13	2,4-D	PPB	1	25	25 ***	100	EPA		2,4-D
H14	2,4,5TP	PPB	1	25	25 ***	10	EPA		2,4,5-TP silvex
H20	FBARIUM	PPB	6	55	0	1000	EPA		Barium, filtered
H21	FCADMIU	PPB	2	55	55 ***	10	EPA		Cadmium, filtered
H22	FCHROMI	PPB	10	55	55 ***	50	EPA		Chromium, filtered
H23	FSILVER	PPB	10	55	55 ***	50	EPA		Silver, filtered
H37	FARSENI	PPB	5	55	55 ***	50	EPA		Arsenic, filtered
H38	FMERCUR	PPB	.1	55	55 ***	2	EPA		Mercury, filtered
H39	FSELENI	PPB	5	55	55 ***	10	EPA		Selenium, filtered
H41	FLEAD	PPB	5	53	50	50	EPA		Lead, filtered

9 2 1 2 3 6 3 0 1 5 0

TABLE 2. (contd)

Constituent List=Quality Characteristics

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Regulatory Limits Limit	Agency	Exceed	Full name
A11	SODIUM	PPB	100	55	0		.			Sodium
A17	MANGESE	PPB	5	55	48		.			Manganese
A19	IRON	PPB	50	55	29		.			Iron
C57	PHENOL	PPB	10	3	3	***	.			Phenol
C73	SULFATE	PPB	500	58	1		.			Sulfate
C75	CHLORID	PPB	500	58	8		.			Chloride
H24	FSODIUM	PPB	100	55	0		.			Sodium, filtered
H29	FMANGAN	PPB	5	55	48		.			Manganese, filtered
H31	FIRON	PPB	50	55	51		.			Iron, filtered

Constituent List=Site Specific

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Regulatory Limits Limit	Agency	Exceed	Full name
010	CO[illegible]	PCI/L	22.5	2	2	***	.			Cobalt-60
024	CS-137	PCI/L	20	2	1		.			Cesium-137
034	RU	PCI/L	172.5	2	2	***	.			Ruthenium-106
121	SR	PCI/L	5	1	1	***	.			Strontium-90
124	U-CHEM	UG/L	.726	2	0		.			Natural uranium
A04	ZINC	PPB	5	55	30		.			Zinc
A06	CALCIUM	PPB	50	55	0		.			Calcium
A12	NICKEL	PPB	10	55	55	***	.			Nickel
A13	COPPER	PPB	10	55	30		1300	EPAP		Copper
A16	ALUMNUM	PPB	150	56	55	***	.			Aluminum
A60	MAGNES	PPB	0	55	0		.			Magnesium
A61	TETRANE	PPB	10	58	56	***	5	EPAP		Tetrachloroethane
A64	METHONE	PPB	10	56	56	***	.			Methyl ethyl ketone
A67	1,1,1-T	PPB	10	56	56	***	200	EPAP		1,1,1-trichloroethane
A68	1,1,2-T	PPB	10	58	58	***	.			1,1,2-trichloroethane
A69	TRICENE	PPB	10	56	55		5	EPAP		Trichloroethylene
A70	PERCENE	PPB	10	56	56	***	.			Perchloroethylene
A71	OPXYLE	PPB	10	58	68	***	440	EPAP		Xylene-o,p
B14	M-XYLE	PPB	10	58	58	***	440	EPAP		Xylene-m
C70	CYANIDE	PPB	10	55	55	***	.			Cyanide
C78	SULFIDE	PPB	1000	55	55	***	.			Sulfide
C80	AMMONIU	PPB	50	58	53		.			Ammonium ion
H18	FZINC	PPB	5	55	44		.			Zinc, filtered
H19	FCALCIU	PPB	50	55	0		.			Calcium, filtered
H25	FNICKEL	PPB	10	55	55	***	.			Nickel, filtered
H26	FCOPPER	PPB	10	55	35		1300	EPAP		Copper, filtered
H28	FALUMIN	PPB	150	55	55	***	.			Aluminum, filtered
H32	FMAGNES	PPB	0	56	0		.			Magnesium, filtered
H57	LPHENOL	PPB	1	23	14		.			Phenol, low DL

TABLE 2. (contd)

------Constituent List=Tag-alongs------

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Regulatory Limits Limit	Agency	Exceed	Full name
A14	VANADUM	PPB	5	55	29	.			Vanadium
A18	POTASUM	PPB	100	55	0	.			Potassium
A80	CHLFORM	PPB	10	58	31	.			Chloroform
A93	METHYCH	PPB	10	58	52	.			Methylene chloride
C78	PHOSPHA	PPB	1000	58	54	.			Phosphate
H27	FVANADI	PPB	5	55	33	.			Vanadium, filtered
H30	FPOTASS	PPB	100	55	0	.			Potassium, filtered

------Constituent List=WAC 173-303-9905------

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Regulatory Limits Limit	Agency	Exceed	Full name
A01	BERYLAM	PPB	5	2	2 ***	.			Beryllium
A02	OSMIUM	PPB	300	2	2 ***	.			Osmium
A03	STRONUM	PPB	300	2	2 ***	.			Strontium
A15	ANTIONY	PPB	100	2	2 ***	.			Antimony
A23	THALIUM	PPB	10	2	2 ***	.			Thallium
A24	THIOURA	PPB	200	2	2 ***	.			Thiourea
A25	ACETREA	PPB	200	2	2 ***	.			1-acetyl-2-thiourea
A26	CHLOREA	PPB	200	2	2 ***	.			1-(o-chlorophenyl) thiourea
A27	DIETROL	PPB	200	2	2 ***	.			Diethylstilbesterol
A28	ETHYREA	PPB	200	2	2 ***	.			Ethylenethiourea
A29	NAPHREA	PPB	200	2	2 ***	.			1-naphthyl-2-thiourea
A32	PHENREA	PPB	200	2	2 ***	.			N-phenylthiourea
A40	DDD	PPB	1	2	2 ***	.			DDD
A41	DDE	PPB	1	2	2 ***	.			DDE
A42	DDT	PPB	1	2	2 ***	.			DDT
A43	HEPTLOR	PPB	1	2	2 ***	0	EPAP		Heptachlor
A44	HEPTIDE	PPB	1	2	2 ***	0	EPAP		Heptchlor epoxide
A46	DIELRIN	PPB	1	2	2 ***	.			Dieldrin
A47	ALDRIN	PPB	1	2	2 ***	.			Aldrin
A48	CHLDANE	PPB	1	2	2 ***	0	EPAP		Chlordane
A49	ENDO1	PPB	1	2	2 ***	.			Endosulfan I
A52	ENDO2	PPB	1	2	2 ***	.			Endosulfan II
A62	BENZENE	PPB	10	2	2 ***	5	EPAP		Benzene
A63	DIOXANE	PPB	500	2	2 ***	.			Dioxane
A65	PYRIDIN	PPB	500	2	2 ***	.			Pyridine
A66	TOLUENE	PPB	10	2	2 ***	2000	EPAP		Toluene
A72	ACROLIN	PPB	10	2	2 ***	.			Acrolein
A73	ACRYILE	PPB	10	2	2 ***	.			Acrylonitrile
A74	BISTHER	PPB	10	2	2 ***	.			Bis(chloromethyl) ether
A75	BROMONE	PPB	10	2	2 ***	.			Bromoacetone
A76	METHBRO	PPB	10	2	2 ***	.			Methyl bromide
A77	CARBIDE	PPB	10	2	2 ***	.			Carbon disulfide
A78	CHLBENZ	PPB	10	2	2 ***	.			Chlorobenzene
A79	CHLTHER	PPB	10	2	2 ***	.			2-chloroethyl vinyl ether
A81	METHCHL	PPB	10	2	2 ***	.			Methyl chloride
A82	CHMTHER	PPB	10	2	2 ***	.			Chloromethyl methyl ether
A83	CROTONA	PPB	10	2	2 ***	.			Crotonaldehyde

TABLE 2. (contd)

------------------------------Constituent List=WAC 173-303-9905------------------------------

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Regulatory Limits Limit	Agency	Exceed	Full name
A84	DIBRCHL	PPB	10	2	2 ***	.			1,2-dibromo-3-chloropropane
A85	DIBRETH	PPB	10	2	2 ***	.			1,2-dibromoethane
A86	DIBRMET	PPB	10	2	2 ***	.			Dibromomethane
A87	DIBUTEN	PPB	10	2	2 ***	.			1,4-dichloro-2-butene
A88	DICDIFM	PPB	10	2	2 ***	.			Dichlorodifluoromethane
A89	1,1-DIC	PPB	10	2	2 ***	.			1,1-dichloroethane
A90	1,2-DIC	PPB	10	2	2 ***	5	EPAP		1,2-dichloroethane
A91	TRANDCE	PPB	10	2	2 ***	70	EPAP		Trans-1,2-dichloroethene
A92	DICETHY	PPB	10	2	2 ***	7	EPAP		1,1-dichloroethylene
A94	DICPANE	PPB	10	2	2 ***	5	EPAP		1,2-dichloropropane
A95	DICPENE	PPB	10	2	2 ***	.			1,3-dichloropropene
A96	NNDIEHY	PPB	10	2	2 ***	.			N,N-diethylhydrazine
A97	1,1-DIM	PPB	3000	2	2 ***	.			1,1-dimethylhydrazine
A98	1,2-DIM	PPB	3000	2	2 ***	.			1,2-dimethylhydrazine
A99	HYDRSUL	PPB	10	2	2 ***	.			Hydrogen sulfide
B01	IODOMET	PPB	10	2	2 ***	.			Iodomethane
B02	METHACR	PPB	10	2	2 ***	.			Methacrylonitrile
B03	METHTHI	PPB	10	2	2 ***	.			Methanethiol
B04	PENTACH	PPB	10	2	2 ***	.			Pentachloroethane
B05	1112-tc	PPB	10	2	2 ***	.			1,1,1,2-tetrachlorethane
B06	1122-tc	PPB	10	2	2 ***	.			1,1,2,2-tetrachlorethane
B08	BROMOF	PPB	10	2	2 ***	.			Bromoform
B09	TRCMEOL	PPB	10	2	2 ***	.			Trichloromethanethiol
B10	TRCMFLM	PPB	10	2	2 ***	.			Trichloromonofluoromethane
B11	TRCPANE	PPB	10	2	2 ***	.			Trichloropropane
B12	123-trp	PPB	10	2	2 ***	.			1,2,3-trichloropropane
B13	VINYIDE	PPB	10	2	2 ***	1	EPAP		Vinyl chloride
B15	DIETHY	PPB	10	2	2 ***	.			Diethylarsine
B19	ACETILE	PPB	3000	2	2 ***	.			Acetonitrile
B20	ACETOPH	PPB	10	2	2 ***	.			Acetophenone
B21	WARFRIN	PPB	10	2	2 ***	.			Warfarin
B22	ACEFENE	PPB	10	2	2 ***	.			2-acetylaminofluorene
B23	AMINDYL	PPB	10	2	2 ***	.			4-aminobyphenyl
B24	AMIISOX	PPB	10	2	2 ***	.			5-(aminomethyl)-3-isoxazolol
B25	AMITROL	PPB	10	2	2 ***	.			Amitrole
B26	ANILINE	PPB	10	2	2 ***	.			Aniline
B27	ARAMITE	PPB	10	2	2 ***	.			Aramite
B28	AURAMIN	PPB	10	2	2 ***	.			Auramine
B29	BENZCAC	PPB	10	2	2 ***	.			Benz[c]acridine
B30	BENZAAN	PPB	10	2	2 ***	.			Benz[a]anthracene
B31	BENDICM	PPB	10	2	2 ***	.			Benzene, dichloromethyl
B32	BENTHOL	PPB	10	2	2 ***	.			Benzenethoil
B33	BENDINE	PPB	10	2	2 ***	.			Benzidine
B34	BENZBFL	PPB	10	2	2 ***	.			Benzo[b]fluoranthene
B35	BENZJFL	PPB	10	2	2 ***	.			Benzo[j]fluoranthene
B36	PBENZQU	PPB	10	2	2 ***	.			P benzoquinone
B37	BENZCHL	PPB	10	2	2 ***	.			Benzyl chloride
B38	BIS2CHM	PPB	10	2	2 ***	.			Bis(2-chloroethoxy) methane
B39	BIS2CHE	PPB	10	2	2 ***	.			Bis(2-chloroethyl) ether
B40	BIS2EPH	PPB	10	2	2 ***	.			Bis(2-ethylhexyl) phthalate

TABLE 2. (contd)

--------------------------------------Constituent List=WAC 173-303-9905--------------------------------------

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Regulatory Limits Limit	Agency	Exceed	Full name
B89	HEXCBEN	PPB	10	2	2 ***	.			Hexachlorobenzene
B90	HEXCBUT	PPB	10	2	2 ***	.			Hexachlorobutadiene
B91	HEXCCYC	PPB	10	2	2 ***	.			Hexachlorocyclopentadiene
B92	HEXCETH	PPB	10	2	2 ***	.			Hexachloroethane
B93	INDENOP	PPB	10	2	2 ***	.			Indeno(1,2,3-cd)pyrene
B94	ISOSOLE	PPB	10	2	2 ***	.			Isosafrole
B95	MALOILE	PPB	10	2	2 ***	.			Malononitrile
B96	MELPHAL	PPB	10	2	2 ***	.			Melphalan
B97	METHAPY	PPB	10	2	2 ***	.			Methapyrilene
B98	METHNYL	PPB	10	2	2 ***	.			Methomyl
B99	METAZIR	PPB	10	2	2 ***	.			2-methylaziridine
C01	METCHAN	PPB	10	2	2 ***	.			3-methylcholanthrene
C02	METBISC	PPB	10	2	2 ***	.			4,4'-methylenebis(2-chloroaniline)
C03	METACTO	PPB	10	2	2 ***	.			2-methyllactonitrile
C04	METACRY	PPB	10	2	2 ***	.			Methyl methacrylate
C05	METMSUL	PPB	10	2	2 ***	.			Methyl methanesulfonate
C06	METPROP	PPB	10	2	2 ***	.			2-methyl-2-(methylthio) propionaldehyde-
C07	METHIOU	PPB	10	2	2 ***	.			Methylthiouracil
C08	NAPHQUI	PPB	10	2	2 ***	.			1,4-naphthoquinone
C09	1-napha	PPB	10	2	2 ***	.			1-naphthylamine
C10	2-napha	PPB	10	2	2 ***	.			2-naphthylamine
C11	NITRANI	PPB	10	2	2 ***	.			P-nitroaniline
C12	NITBENZ	PPB	10	2	2 ***	.			Nitrobenzine
C13	NITPHEN	PPB	10	2	2 ***	.			4-nitrophenol
C14	NNIBUTY	PPB	10	2	2 ***	.			N-nitrosodi-n-butylamine
C15	NNIDIEA	PPB	10	2	2 ***	.			N-nitrosodiethanolamine
C16	NNIDIEY	PPB	10	2	2 ***	.			N-nitrosodiethylamine
C17	NNIDIME	PPB	10	2	2 ***	.			N-nitrosodimethylamine
C18	NNIMETH	PPB	10	2	2 ***	.			N-nitrosomethylethylamine
C19	NNIURET	PPB	10	2	2 ***	.			N-nitroso-N-methylurethane
C20	NNIVINY	PPB	10	2	2 ***	.			N-nitrosomethylvinylamine
C21	NNIMORP	PPB	10	2	2 ***	.			N-nitrosomorpholine
C22	NNINICO	PPB	10	2	2 ***	.			N-nitrosonornicotine
C23	NNIPIPE	PPB	10	2	2 ***	.			N-nitrosopiperidine
C24	NITRPYR	PPB	10	2	2 ***	.			Nitrosopyrrolidine
C25	NITRTOL	PPB	10	2	2 ***	.			5-nitro-o-toluidine
C26	PENTCHB	PPB	10	2	2 ***	.			Pentachlorobenzene
C27	PENTCHN	PPB	10	2	2 ***	.			Pentachloronitrobenzene
C28	PENTCHP	PPB	10	2	2 ***	220	EPAP		Pentachlorophenol
C29	PHENTIN	PPB	10	2	2 ***	220	EPAP		Phenacetin
C30	PHENINE	PPB	10	2	2 ***	.			Phenylenediamine
C31	PHTHEST	PPB	10	2	2 ***	.			Phthalic acid esters
C32	PICOLIN	PPB	10	2	2 ***	.			2-picoline
C33	PRONIDE	PPB	10	2	2 ***	.			Pronamide
C34	RESERPI	PPB	10	2	2 ***	.			Reserpine
C35	RESORCI	PPB	10	2	2 ***	.			Resorcinol
C36	SAFROL	PPB	10	2	2 ***	.			Safrol
C37	TETRCHB	PPB	10	2	2 ***	.			1,2,4,5-tetrachlorobenzene
C39	TETRCHP	PPB	10	2	2 ***	.			2,3,4,6-tetrachlorophenol
C40	THIURAM	PPB	10	2	2 ***	.			Thiuram

TABLE 2. (contd)

Constituent List-WAC 173-303-9905

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Regulatory Limits Limit	Agency	Exceed	Full name
C41	TOLUDIA	PPB	10	2	2	***	.			Toluenediamine
C42	OTOLHYD	PPB	10	2	2	***	.			O-toluidine hydrochloride
C43	TRICHLB	PPB	10	2	2	***	.			1,2,4-trichlorobenzene
C44	245-trp	PPB	10	2	2	***	.			2,4,5-trichlorophenol
C45	246-trp	PPB	10	2	2	***	.			2,4,6-trichlorophenol
C46	TRIPHOS	PPB	10	2	2	***	.			O,O,O-triethyl phosphorothioate
C47	SYMTRIN	PPB	10	2	2	***	.			Sym-trinitrobenzene
C48	TRISPHO	PPB	10	2	2	***	.			Tris(2,3-dibromopropyl) phosphate
C49	BENZOPY	PPB	10	2	2	***	.			Benzo[a]pyrene
C50	CHLNAPZ	PPB	10	2	2	***	.			Chlornaphazine
C51	BIS2ETH	PPB	10	2	2	***	.			Bis(2-chloroisopropyl)ether
C52	HEXAENE	PPB	10	2	2	***	.			Hexachloropropene
C53	HYDRAZI	PPB	3000	2	2	***	.			Hydrazine
C54	HEXACHL	PPB	10	2	2	***	.			Hexachlorophene
C55	NAPHTHA	PPB	10	2	2	***	.			Naphthalene
C56	123TRI	PPB	10	2	2	***	.			1,2,3-trichlorobenzene
C58	135TRI	PPB	10	2	2	***	.			1,3,5-trichlorobenzene
C59	1234TE	PPB	10	2	2	***	.			1,2,3,4-tetrachlorobenzene
C60	1235TE	PPB	10	2	2	***	.			1,2,3,5-tetrachlorobenzene
C61	TETEPYR	PPB	100	2	2	***	.			Tetraethylpyrophosphate
C62	CHLLATE	PPB	100	2	2	***	.			Chlorobenzilate
C63	CARBPHT	PPB	2	2	2	***	.			Carbophenothion
C64	DISULFO	PPB	2	2	2	***	.			Disulfoton
C65	DIMETHO	PPB	5	2	2	***	.			Dimethoate
C66	METHPAR	PPB	2	2	2	***	.			Methyl parathion
C67	PARATHI	PPB	2	2	2	***	.			Parathion
C71	FORMALN	PPB	500	2	2	***	.			Formalin
C79	KEROSEN	PPB	10000	2	2	***	.			Kerosene
C81	ETHYGLY	PPB	10000	2	2	***	.			Ethylene glycol
C86	DIOXIN	PPB	.1	2	2	***	.			Dioxin
C87	CITRUSR	PPB	1000	2	2	***	.			Citrus red
C88	CYANBRO	PPB	3000	2	2	***	.			Cyanogen bromide
C89	CYANCHL	PPB	3000	2	2	***	.			Cyanogen chloride
C90	PARALDE	PPB	3000	2	2	***	.			Paraldehyde
C91	STRYCHN	PPB	50	2	2	***	.			Strychnine
C92	MALHYDR	PPB	500	2	2	***	.			Maleic hydrazide
C93	NICOTIN	PPB	100	2	2	***	.			Nicotinic acid
C94	ACRYIDE	PPB	3000	2	.	***	8	EPAP		Acrylamide
C95	ALLYLAL	PPB	3000	2	2	***	.			Allyl alcohol
C96	CHLORAL	PPB	3000	2	2	***	.			Chloral
C97	CHLACET	PPB	3000	2	2	***	.			Chloroacetaldehyde
C98	CHLPROP	PPB	3000	2	2	***	.			3-chloropropionitrile
C99	CYANOGN	PPB	3000	2	2	***				Cyanogen
H01	DICPROP	PPB	3000	2	2	***				Dichloropropanol
H03	ETHCARB	PPB	3000	2	2	***	.			Ethyl carbamate
H04	ETHCYAN	PPB	3000	2	2	***	.			Ethyl cyanide
H05	ETHOXID	PPB	3000	2	2	***	.			Ethylene oxide
H06	ETHMETH	PPB	3000	2	2	***	.			Ethyl methacrylate
H07	FLUDROA	PPB	3000	2	2	***	.			Fluoroacetic acid
H08	GLYCIDY	PPB	3000	2	2	***	.			Glycidylaldehyde
H09	ISOBUTY	PPB	3000	2	2	***	.			Isobutyl alcohol

TABLE 2. (contd)

--Constituent List=WAC 173-303-9905--

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Regulatory Limits Limit	Agency	Exceed	Full name
H10	METZINE	PPB	3000	2	2	***	.			Methyl hydrazine
H11	PROPYLA	PPB	3000	2	2	***	.			N-propylamine
H12	PROPYNO	PPB	3000	2	2	***	.			2-propyn-1-ol
H15	2,4,5-T	PPB	1	2	2	***	.			2,4,5-T
H33	FBERYLL	PPB	5	2	2	***	.			Beryllium, filtered
H34	FOSMIUM	PPB	300	2	2	***	.			Osmium, filtered
H35	FSTRONT	PPB	300	2	2	***	.			Strontium, filtered
H36	FANTIMO	PPB	100	2	2	***	.			Antimony, filtered
H40	FTHALLI	PPB	10	2	2	***	.			Thallium, filtered

*** - Indicates all samples were below detection limits

xxx - Indicates that regulatory limits were exceeded

EPA - based on limits given in 40CFR 265, Appendix III,
EPA Interim Primary Drinking Water Standards
EPAP - based on proposed Maximum Contaminant Levels

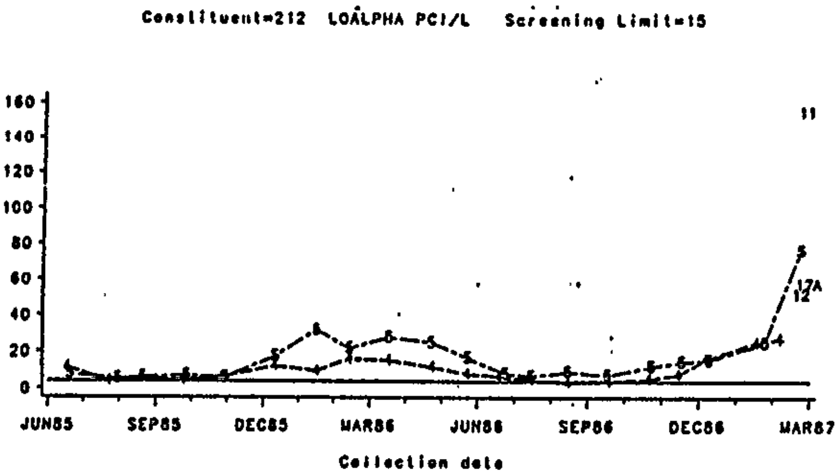

FIGURE 2. Gross Alpha Concentrations in Samples from Monitoring Wells Immediately Adjacent to the 300 Area Process Trenches, June 1985 through February 1987

wells with alpha levels over 15 pCi/L this reporting period are: well 399-3-10 with an increase in January from 11.2 (December) to 17.9 and then a decrease in February to 7.3 pCi/L; well 399-4-1 with an increase in January to 17.6 from December's 10.1 level and then a decrease to 10.8 in February; and well 399-4-7, which has consistently had concentration levels over 20 pCi/L this past year. This period's reported alpha levels are 30 in December, 23.1 in January, and 31.7 pCi/L in February.

Radium concentrations in all wells except 699-S30E15A remained the same as previously reported. In February, radium concentrations in well 699-S30E15A increased from less than 0.2 pCi/L to approximately 1.5 pCi/L, which is still below the 5-pCi/L USEPA drinking water limit.

Nitrate concentrations in wells near the trenches increased in December but declined in January in all wells except 399-1-1 and 399-1-2 (Figure 6). During February, the nitrate levels in 399-1-1 and 399-1-2 declined to normal levels and increased in wells 399-1-5 and 399-2-1 (Figures 5, 6, and 7).

Solid Horizontal Line represents Detection Limit

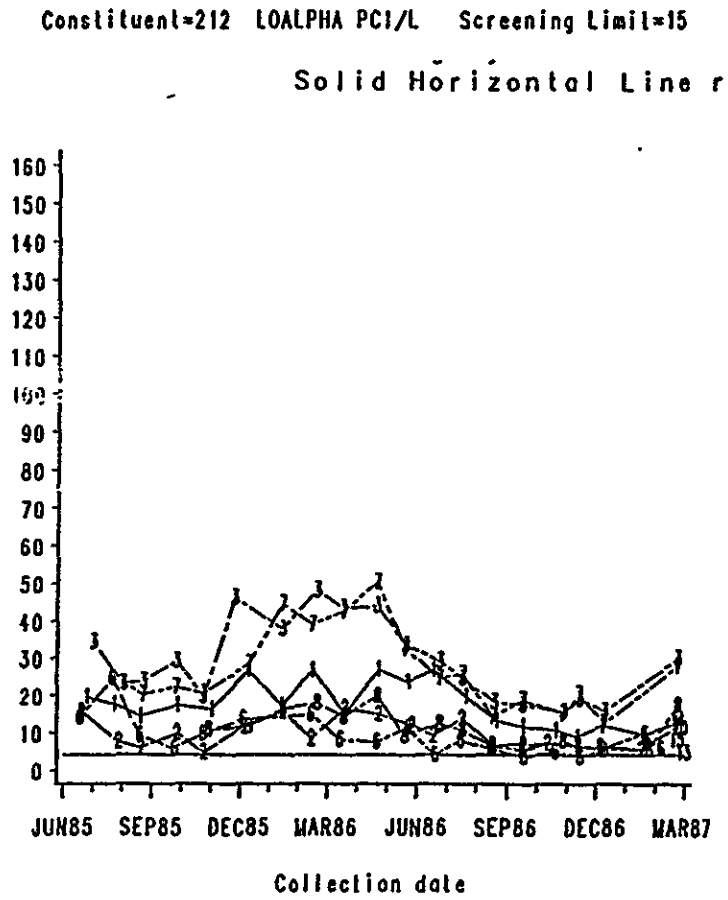

FIGURE 3. Gross Alpha Concentrations in Samples from Monitoring Wells Near the 300 Area Process Trenches, June 1985 Through February 1987

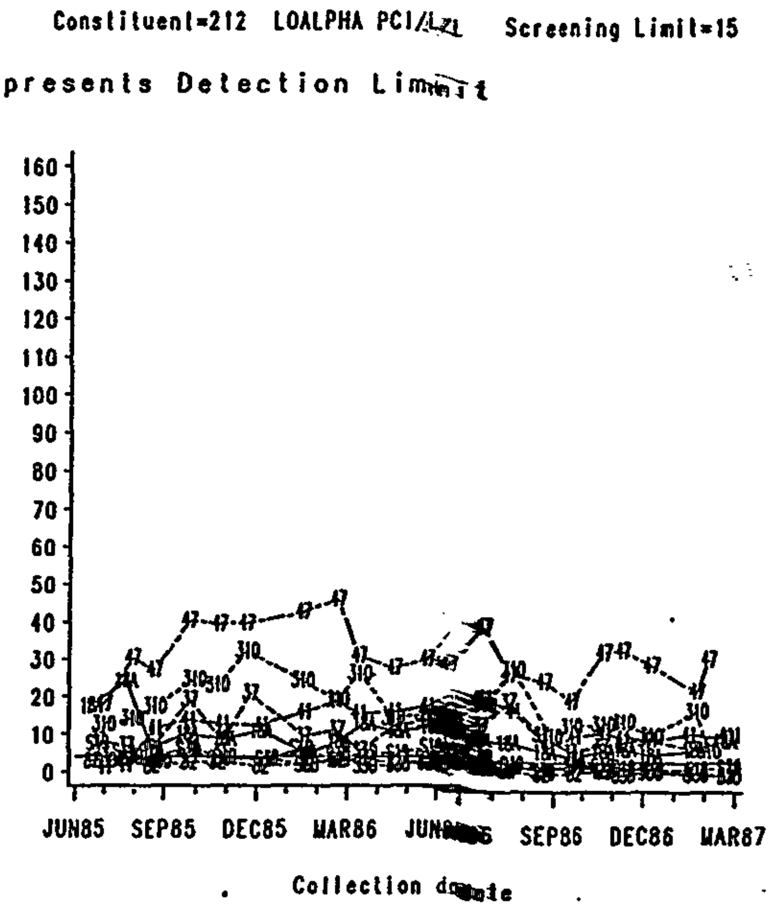

FIGURE 4. Gross Alpha Concentrations in Samples from Monitoring Wells Distant from the 300 Area Process Trenches, June 1985 through February 1987

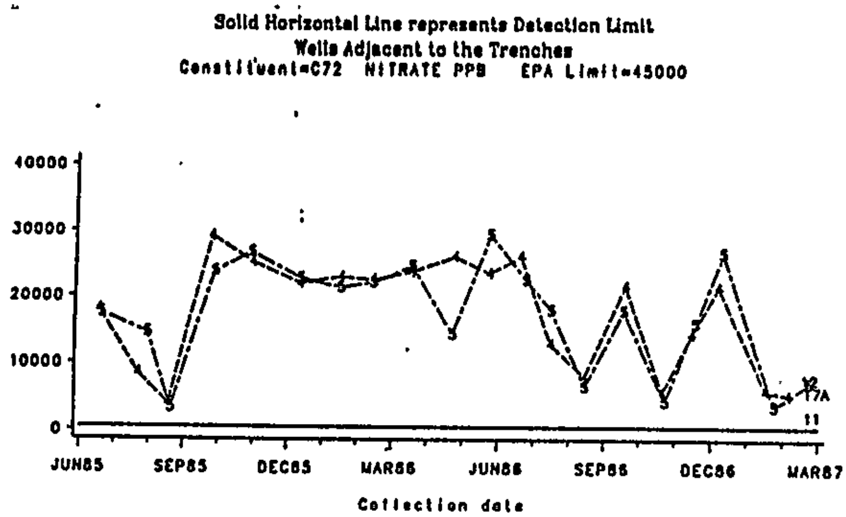

FIGURE 5. Nitrate Concentrations in Samples from Monitoring Wells Immediately Adjacent to the 300 Area Process Trenches, June 1985 through February 1987

With few exceptions, lead concentrations in all wells remained below detection limits. Lead concentrations above the detection limit remained well below the USEPA drinking water limit of 50 ppb.

The pH of samples from wells 399-1-4 and 399-1-6 decreased to approximately 5.0 during February (Figures 8 and 9). This decline in pH is believed to be associated with release of acid reported by UNC in early February.

The level of trichloroethylene (TCE) in well 399-4-1 has been reported sporadically above detection level and the proposed drinking water standard, but was not detected this quarter. Based on the isolated occurrence of TCE in well 399-4-1, the well's position relative to the trenches, and the direction of ground-water flow in the 300 Area, the elevated level of TCE in this well is presumably attributable to a source other than the trenches.

9 2 1 2 5 6 3 0 1 5 9

Solid Horizontal Line represents Detection Limit

Wells near the Trenches
Constituent=C72 NITRATE PPB EPA Limit=45000

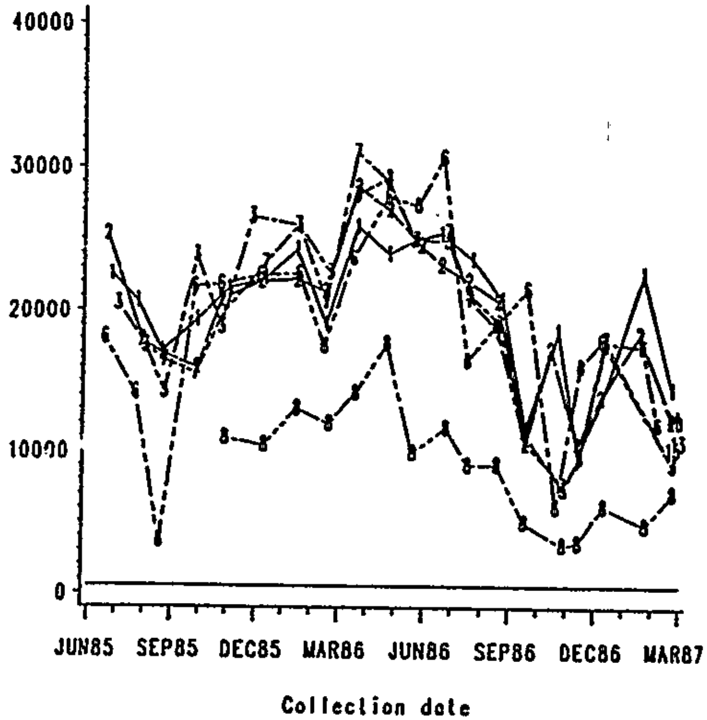

FIGURE 6. Nitrate Concentrations in Samples from Monitoring Wells Near the the 300 Area Process Trenches, June 1985 through February 1987

Wells Distant from the Trenches
Constituent=C72 NITRATE PPB EPA Limit=45000

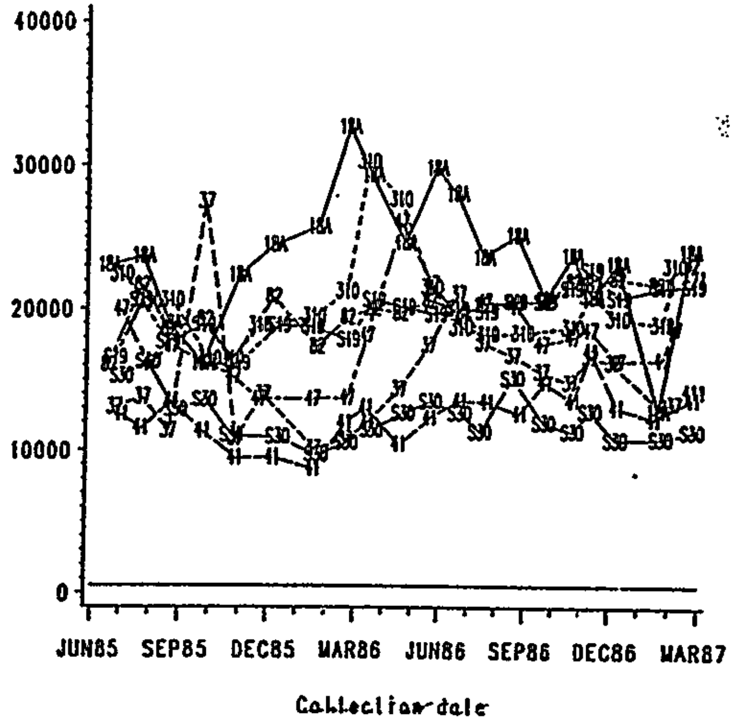

FIGURE 7. Nitrate Concentrations in Samples from Monitoring Wells Distant from the 300 Area Process Trenches, June 1985 Through February 1987

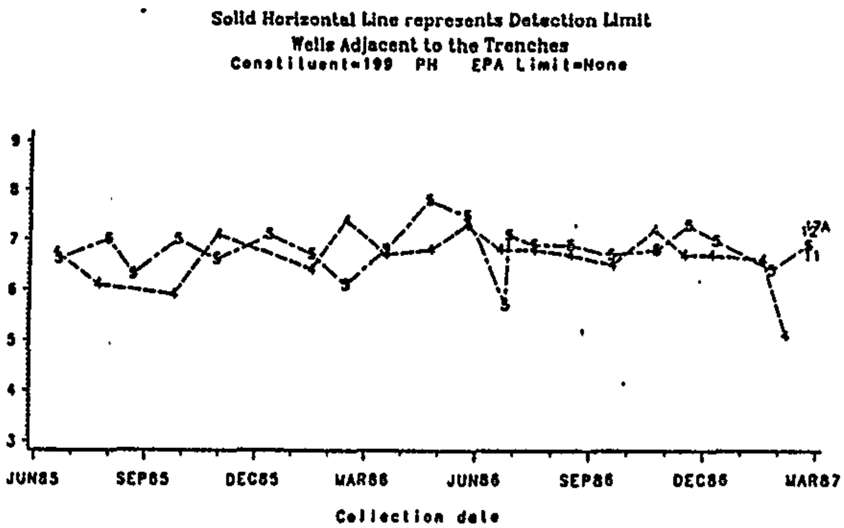

FIGURE 8. pH Concentrations in Samples from Monitoring Wells Immediately Adjacent to the 300 Area Process Trenches, June 1985 Through February 1987

During the previous reporting period, the analytical results for metals in the unfiltered samples from well 399-3-7 had been higher than for the filtered samples. During this quarter, however, the concentrations of the constituents in the filtered samples increased to levels similar to those detected in unfiltered samples. The analytical results for filtered and unfiltered samples from all other wells agree very closely for all metals except iron. Iron levels in unfiltered samples from many of the wells are higher than in filtered samples.

Since monitoring was initiated, well 399-1-8, which samples the unconfined aquifer at an intermediate depth, has generally had higher concentrations of most natural constituents than reported for shallow wells 399-1-3 and 399-1-7 at the same location. Those constituents that are typically present in higher concentrations in samples from well 399-1-8 than in samples from the adjacent shallow wells (e.g., barium, potassium, magnesium, manganese, and sodium) appear to be indicative of lithological differences in the aquifer intervals being sampled. Conversely, ground-water contaminants (e.g., gross alpha, gross beta, nitrate, copper, chloroform, ammonium) are generally detected in lower

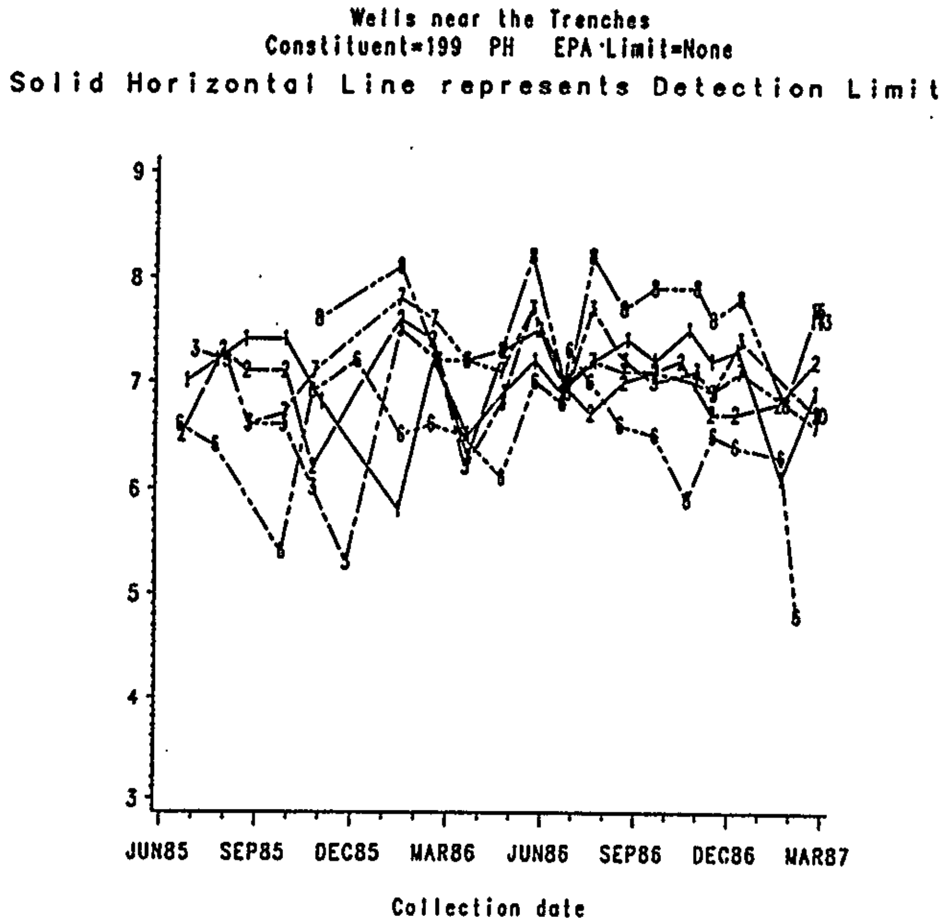

FIGURE 9. pH Concentrations in Samples from Monitoring Wells Near the 300 Area Process Trenches, June 1985 through February 1987

concentrations in samples from well 399-1-8 than in samples from the shallow wells. Any increase in concentration of contaminants reported in samples from the shallow wells is generally accompanied by an increase of lesser magnitude in samples from well 399-1-8. This increase indicates that contaminants are reaching the intermediate portion of the unconfined aquifer but in concentrations less than in the shallow portions of the aquifer.

Seasonal variations in the detected concentrations of several constituents are evident. Although the variations are not universal, the following generalizations can be made. The reported levels of gross alpha, gross beta, chloride, copper, and nitrate increased in samples from several wells during the first half of 1986. Based on the data for January and February of 1987, the concentrations of these constituents, except nitrate, appear to be increasing. Chloroform concentrations in most wells near the trenches increased between June and September in both 1985 and 1986 (Figures 10, 11, and 12). Continued monitoring in the following months will confirm whether or not the trends are repeating. Whether variations in the constituent concentrations are caused by seasonal changes in ground-water flow or river stage, or are caused by other factors such as operational procedures (e.g., the weir cleaning as discussed above) is unclear at this time. Future monitoring and review of existing data on water levels and operational procedures may help to define the cause(s) of these variations.

The first draft of the interim characterization report is nearing completion. It is scheduled to be released to the State and the USEPA for comments during the next quarter.

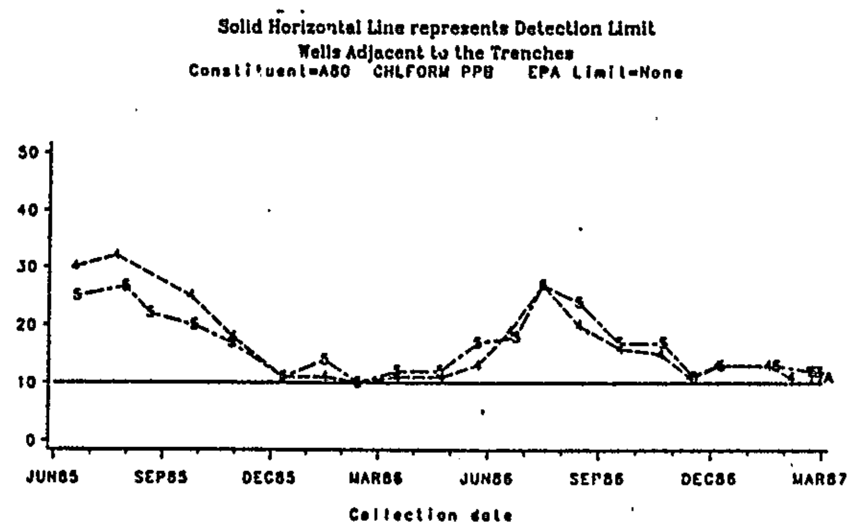

FIGURE 10. Chloroform Concentrations in Samples from Monitoring Wells Immediately Adjacent to the 300 Area Process Trenches, June 1985 through February 1987

9 2 1 2 5 6 3 0 1 6 3

Solid Horizontal Line represents Detection Limit

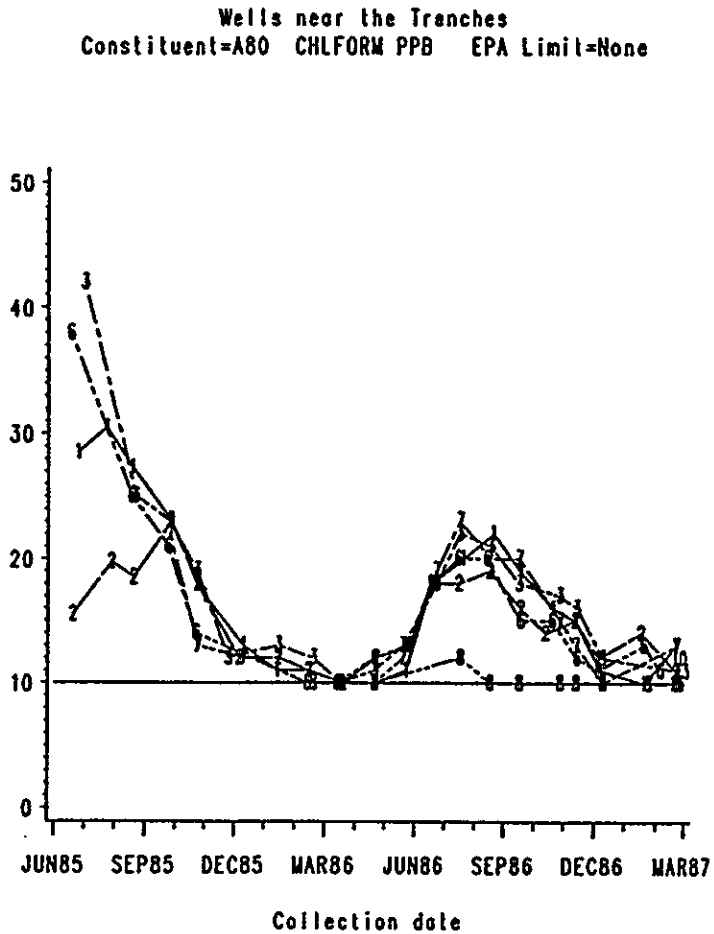

FIGURE 11. Chloroform Concentrations in Samples from Monitoring Wells Near the 300 Area Process Trenches, June 1985 through February 1987

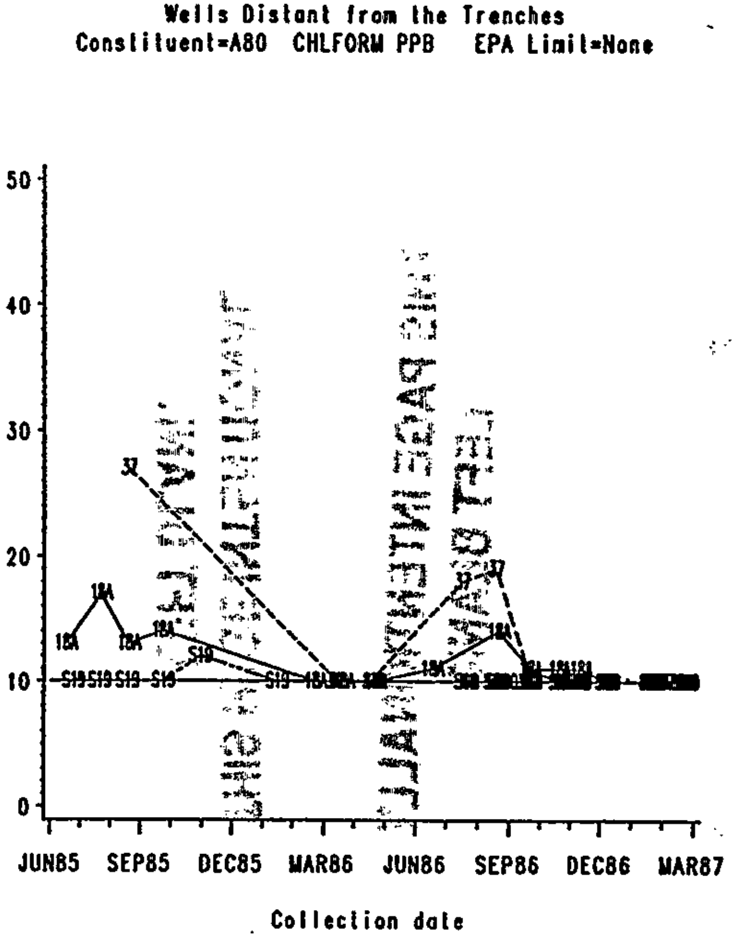

FIGURE 12. Chloroform Concentrations in Samples from Monitoring Wells Distant from the 300 Area Process Trenches, June 1985 Through February 1987

183-H SOLAR EVAPORATION BASINS

Three recently issued reports (USDOE 1986c, e; 1987) contain information on the progress made and the data obtained by the RCRA Compliance Ground-Water Monitoring Project for the 183-H Solar Evaporation Basins during the time period from June 1985 through December 1986. This report includes information on subsequent activities and data.

A more detailed discussion of all well installation and hydrogeologic characterization work conducted since August 1986 was compiled during this quarter in the draft document "Interim Characterization Report for the Area Surrounding the 183-H Basins." The final version of this report will be issued in the next quarter.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

Expansion of the monitoring project through installation of 16 new wells was completed during the last reporting period. Locations of all wells now used to monitor the 183-H Basins are shown on Figure 13. A discussion of drilling including well completion information was included in previous progress reports (USDOE 1986b, c; 1987).

During this reporting period, selected lithologic samples from the new wells were analyzed for the following parameters:

1. grain size distribution - performed on all samples
2. soil moisture content - performed on all drive barrel samples collected above the water table
3. soil moisture retention - performed on all drive barrel samples collected above the water table
4. bulk density - performed on six to eight samples from each of the three deep wells
5. bulk porosity - calculated for the bulk density samples
6. hydraulic conductivity - performed on a total of three split-spoon samples from deep wells 199-H4-12C and 199-H4-15C.

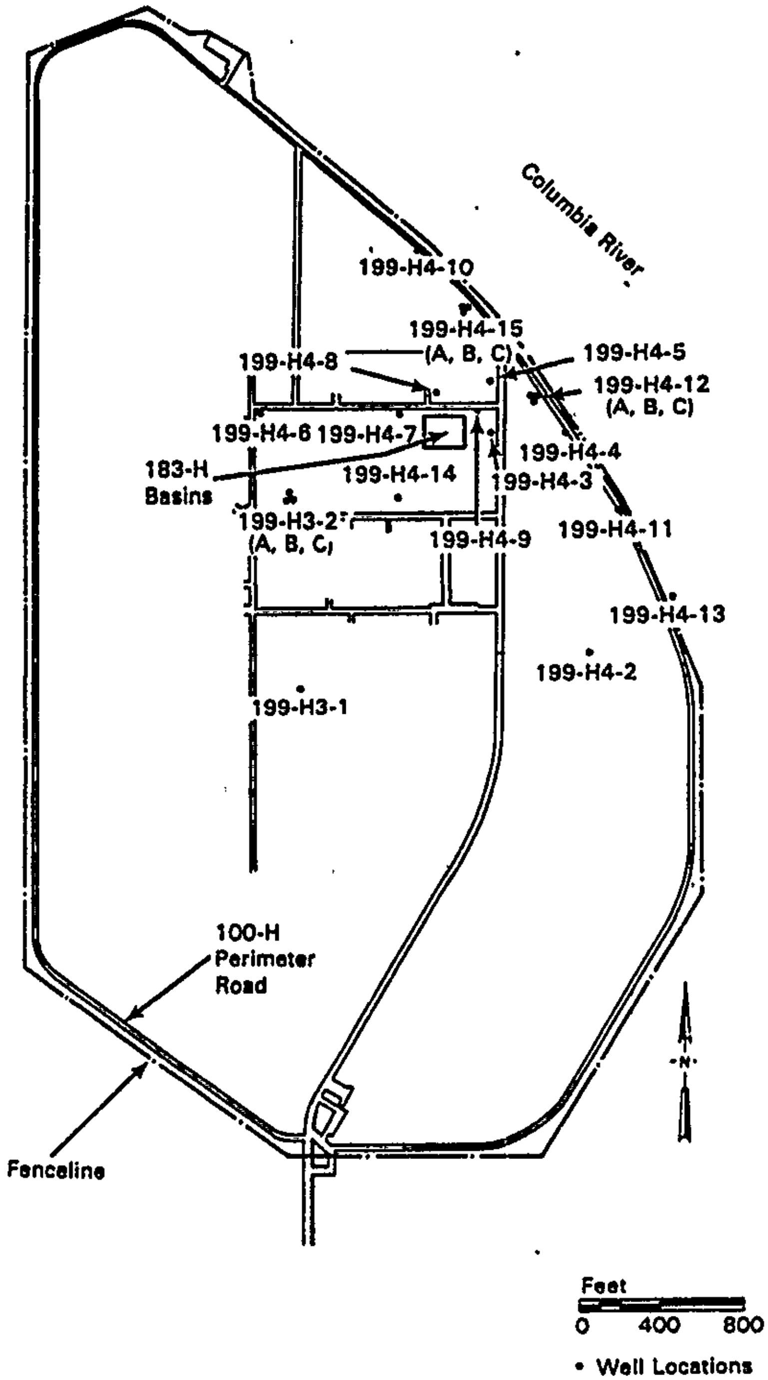

FIGURE 13. Location of 100-H Area Monitoring Wells

9 2 1 2 5 6 3 0 1 5 6

These analyses have been completed and interpretation of the results are now in progress. These data and their significance will be presented in a future progress report.

ROUTINE SAMPLING AND ANALYSIS OF GROUND WATER

Routine sampling and analysis of the ground water beneath this facility has been conducted on a monthly basis since June 1985. Recent activities under this effort and results obtained are discussed in the following two sections.

Collection and Analysis

Monthly sampling of the five wells originally in the monitoring network continued throughout the quarter. In addition, dedicated, piston-type sampling pumps were installed in the last of the 15 new wells. These wells were then added to the monitoring network in January. All 20 wells were sampled three times during the quarter. Most of the ground-water samples were analyzed for the standard list of constituents (see Table 2 in USDOE 1986e). To satisfy regulatory requirements and to ensure that no contaminants were overlooked, additional analyses (listed in Table 3 of USDOE 1986e) were performed once during the quarter for the upgradient well 199- H3-1 and the downgradient well 199-H4-3.

Because of continuing problems with their total organic carbon (TOC) analyzer, UST has purchased and installed a new TOC analyzer. The backlog of samples has been eliminated. Samples were collected, preserved, and stored properly and are not believed to have been affected by the short delay before analysis.

Discussion of Results

Analytical data obtained from samples collected in the 100-H Area between December 1986 and February 1987 are included in this report and discussed in the following paragraphs. Results for samples collected in March will be included in the next progress report.

Analytical results from this reporting period are comparable to the previously reported data. In general, elevated levels of certain metals, anions, radionuclides, and chloroform are present. Some of the data are discussed in

TABLE 3. Summary of Analyses Conducted on Samples from 100-H Wells, December 1986 Through February 1987

--------Constituent List=Contamination Indicators--------

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Regulatory Limits Limit	Agency	Exceed	Full name
191	CONDUCT	UMHO	1	61	0		.			Specific conductance
199	PH		.1	61	0		.			pH
C68	TOX	PPB	100	61	60		.			Total organic halogen
C69	TOC	PPB	1000	60	40		.			Total organic carbon

--------Constituent List=Drinking Water Standards--------

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Regulatory Limits Limit	Agency	Exceed	Full name
109	COLIFRM	MPN	2.2	61	42		1	EPA		Coliform bacteria
111	BETA	PCI/L	8	51	0		50	EPA	xxx	Gross beta
181	RADIUM	PCI/L	1	51	10		5	EPA		Radium
212	ALGALPHA	PCI/L	4	51	2		15	EPA	xxx	Gross alpha
A06	BARIUM	PPB	6	51	0		1000	EPA		Barium
A07	CADMIUM	PPB	2	51	60		10	EPA		Cadmium
A08	CHROMUM	PPB	10	51	0		50	EPA	xxx	Chromium
A10	SILVER	PPB	10	51	61	***	50	EPA		Silver
A20	ARSENIC	PPB	5	61	49		50	EPA		Arsenic
A21	MERCURY	PPB	.1	51	60		2	EPA		Mercury
A22	SELENUM	PPB	5	61	61	***	10	EPA		Selenium
A33	ENDRIN	PPB	1	2	2	***	.2	EPA		Endrin
A34	METHLOR	PPB	1	2	2	***	100	EPA		Methoxychlor
A35	TOXAENE	PPB	1	2	2	***	5	EPA		Toxaphene
A36	a-BHC	PPB	1	2	2	***	4	EPA		Alpha-BHC
A37	b-BHC	PPB	1	2	2	***	4	EPA		Beta-BHC
A38	g-BHC	PPB	1	2	2	***	4	EPA		Gamma-BHC
A39	d-BHC	PPB	1	2	2	***	4	EPA		Delta-BHC
A[illegible]1	LEADGF	PPB	5	61	40		50	EPA		Lead (graphite furnace)
C72	NITRATE	PPB	500	61	0		45000	EPA	xxx	Nitrate
C74	FLUORID	PPB	500	61	60		1400	EPA		Fluoride
H13	2,4-D	PPB	1	2	2	***	100	EPA		2,4-D
H14	2,4,5TP	PPB	1	2	2	***	10	EPA		2,4,5-TP silvex
H20	FBARIUM	PPB	6	50	0		1000	EPA		Barium, filtered
H21	FCADMIU	PPB	2	50	49		10	EPA		Cadmium, filtered
H22	FCHROMI	PPB	10	50	6		50	EPA	xxx	Chromium, filtered
H23	FSILVER	PPB	10	50	50	***	50	EPA		Silver, filtered
H37	FARSENI	PPB	5	50	46		50	EPA		Arsenic, filtered
H38	FMERCUR	PPB	.1	50	50	***	2	EPA		Mercury, filtered
H39	FSELENI	PPB	5	50	50	***	10	EPA		Selenium, filtered
H41	FLEAD	PPB	5	50	40		50	EPA		Lead, filtered

TABLE 3. (contd)

--Constituent List=Quality Characteristics--

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Regulatory Limits Limit	Agency	Exceed	Full name
A11	SODIUM	PPB	100	51	0	.			Sodium
A17	MANGESE	PPB	5	51	24	.			Manganese
A19	IRON	PPB	50	51	16	.			Iron
C57	PHENOL	PPB	10	2	2 ***	.			Phenol
C73	SULFATE	PPB	500	51	0	.			Sulfate
C75	CHLORID	PPB	500	51	0	.			Chloride
H24	FSODIUM	PPB	100	50	0	.			Sodium, filtered
H29	FMANGAN	PPB	5	50	34	.			Manganese, filtered
H31	FIRON	PPB	50	50	40	.			Iron, filtered

--Constituent List=Site Specific--

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Regulatory Limits Limit	Agency	Exceed	Full name
010	C0	PCI/L	22.5	2	2 ***	.			Cobalt-60
024	CS-137	PCI/L	20	2	2 ***	.			Cesium-137
034	RU	PCI/L	172.5	2	2 ***	.			Ruthenium-106
121	SR	PCI/L	5	2	0	.			Strontium-90
124	U-CHEM	UG/L	.725	2	0	.			Natural uranium
A03	STRONUM	PPB	300	51	39	.			Strontium
A04	ZINC	PPB	5	51	30	.			Zinc
A05	CALCIUM	PPB	50	51	0	.			Calcium
A12	NICKEL	PPB	10	51	34	.			Nickel
A13	COPPER	PPB	10	51	44	1300	EPAP		Copper
A14	VANADUM	PPB	5	51	10	.			Vanadium
A16	ALUMNUM	PPB	150	51	36	.			Aluminum
A18	POTASUM	PPB	100	51	0	.			Potassium
A60	MAGNES	PPB	0	51	0	.			Magnesium
A67	1,1,1-T	PPB	10	51	49	200	EPAP		1,1,1-trichloroethane
A70	PERCENE	PPB	10	51	50	.			Perchloroethylene
A80	CHLFORM	PPB	10	51	12	.			Chloroform
A93	METHYCH	PPB	10	51	51 ***	.			Methylene chloride
C80	AMMONIU	PPB	50	51	41	.			Ammonium ion
H18	FZINC	PPB	5	50	32	.			Zinc, filtered
H19	FCALCIU	PPB	50	50	0	.			Calcium, filtered
H25	FNICKEL	PPB	10	50	41	.			Nickel, filtered
H26	FCOPPER	PPB	10	50	44	1300	EPAP		Copper, filtered
H27	FVANADI	PPB	5	50	10	.			Vanadium, filtered
H28	FALUMIN	PPB	150	50	44	.			Aluminum, filtered
H30	FPOTASS	PPB	100	50	0	.			Potassium, filtered
H32	FMAGNES	PPB	0	50	0	.			Magnesium, filtered
H35	FSTRONT	PPB	300	50	39	.			Strontium, filtered

TABLE 3. (contd)

Constituent List=Site Specific tag-alongs

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Regulatory Limits Limit	Agency	Exceed	Full name
A01	BERYLAM	PPB	5	51	51	•••	.			Beryllium
A02	OSMIUM	PPB	300	51	51	•••	.			Osmium
A16	ANTIONY	PPB	100	51	51	•••	.			Antimony
A61	TETRANE	PPB	10	51	51	•••	5	EPAP		Tetrachloroethane
A64	METHONE	PPB	10	51	51	•••	.			Methyl ethyl ketone
A68	1,1,2-T	PPB	10	51	51	•••	.			1,1,2-trichloroethane
A69	TRICENE	PPB	10	51	51	•••	5	EPAP		Trichloroethylene
A71	OPXYLE	PPB	10	51	51	•••	440	EPAP		Xylene-o,p
B14	M-XYLE	PPB	10	51	51	•••	440	EPAP		Xylene-m
C76	PHOSPHA	PPB	1000	51	50		.			Phosphate
N33	FBERYLL	PPB	5	50	49		.			Beryllium, filtered
N34	FOSMIUM	PPB	300	50	50	•••	.			Osmium, filtered
N36	FANTIMO	PPB	100	50	50	•••	.			Antimony, filtered

Constituent List=WAC 173-303-9905

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Regulatory Limits Limit	Agency	Exceed	Full name
A23	THALIUM	PPB	10	2	2	•••	.			Thallium
A24	THIOURA	PPB	200	2	2	•••	.			Thiourea
A25	ACETREA	PPB	200	2	2	•••	.			1-acetyl-2-thiourea
A26	CHLOREA	PPB	200	2	2	•••	.			1-(o-chlorophenyl) thiourea
A27	DIETROL	PPB	200	2	2	•••	.			Diethylstilbesterol
A28	ETHYREA	PPB	200	2	2	•••	.			Ethylenethiourea
A29	NAPHREA	PPB	200	2	2	•••	.			1-naphthyl-2-thiourea
A32	PHENREA	PPB	200	2	2	•••	.			N-phenylthiourea
A40	DDD	PPB	1	2	2	•••	.			DDD
A41	DDE	PPB	1	2	2	•••	.			DDE
A42	DDT	PPB	1	2	2	•••	.			DDT
A43	HEPTLOR	PPB	1	2	2	•••	0	EPAP		Heptachlor
A44	HEPTIDE	PPB	1	2	2	•••	0	EPAP		Heptchlor epoxide
A46	DIELRIN	PPB	1	2	2	•••	.			Dield.in
A47	ALDRIN	PPB	1	2	2	•••	.			Aldrin
A48	CHLOANE	PPB	1	2	2	•••	0	EPAP		Chlordane
A49	ENDO1	PPB	1	2	2	•••	.			Endosulfan I
A52	ENDO2	PPB	1	2	2	•••	.			Endosulfan II
A62	BENZENE	PPB	10	2	2	•••	5	EPAP		Benzene
A63	DIOXANE	PPB	500	2	2	•••	.			Dioxane
A65	PYRIDIN	PPB	500	2	2	•••	.			Pyridine
A66	TOLUENE	PPB	10	2	2	•••	2000	EPAP		Toluene
A72	ACROLIN	PPB	10	2	2	•••	.			Acrolein
A73	ACRYILE	PPB	10	2	2	•••	.			Acrylonitrile
A74	BISTHER	PPB	10	2	2	•••	.			Bis(chloromethyl) ether
A75	BROMONE	PPB	10	2	2	•••	.			Bromoacetone
A76	METHBRO	PPB	10	2	2	•••	.			Methyl bromide
A77	CARBIDE	PPB	10	2	2	•••	.			Carbon disulfide
A78	CHLBENZ	PPB	10	2	2	•••	.			Chlorobenzene
A79	CHLTHER	PPB	10	2	2	•••	.			2-chloroethyl vinyl ether
A81	METHCHL	PPB	10	2	2	•••	.			Methyl chloride
A82	CHMTHER	PPB	10	2	2	•••	.			Chloromethyl methyl ether
A83	CROTONA	PPB	10	2	2	•••	.			Crotonaldehyde

TABLE 3. (contd)

---------------------Constituent List=WAC 173-303-9905---------------------

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Regulatory Limits Limit	Agency	Exceed	Full name
A84	DIBRCHL	PPB	10	2	2	***	.			1,2-dibromo-3-chloropropane
A85	DIBRETH	PPB	10	2	2	***	.			1,2-dibromoethane
A86	DIBRMET	PPB	10	2	2	***	.			Dibromomethane
A87	DIBUTEN	PPB	10	2	2	***	.			1,4-dichloro-2-butene
A88	DICDIFM	PPB	10	2	2	***	.			Dichlorodifluoromethane
A89	1,1-DIC	PPB	10	2	2	***	.			1,1-dichloroethane
A90	1,2-DIC	PPB	10	2	2	***	5	EPAP		1,2-dichloroethane
A91	TRANDCE	PPB	10	2	2	***	70	EPAP		Trans-1,2-dichloroethene
A92	DICETHY	PPB	10	2	2	***	7	EPAP		1,1-dichloroethylene
A94	DICPANE	PPB	10	2	2	***	6	EPAP		1,2-dichloropropane
A95	DICPENE	PPB	10	2	2	***	.			1,3-dichloropropene
A96	NNDIEHY	PPB	10	2	2	***	.			N,N-diethylhydrazine
A97	1,1-DIM	PPB	3000	2	2	***	.			1,1-dimethylhydrazine
A98	1,2-DIM	PPB	3000	2	2	***	.			1,2-dimethylhydrazine
A99	HYDRSUL	PPB	10	2	2	***	.			Hydrogen sulfide
B01	IODOMET	PPB	10	2	2	***	.			Iodomethane
B02	METHACR	PPB	10	2	2	***	.			Methacrylonitrile
B03	METHTHI	PPB	10	2	2	***	.			Methanethiol
B04	PENTACH	PPB	10	2	2	***	.			Pentachloroethane
B05	1112-tc	PPB	10	2	2	***	.			1,1,1,2-tetrachloroethane
B06	1122-tc	PPB	10	2	2	***	.			1,1,2,2-tetrachloroethane
B08	BROMORM	PPB	10	2	2	***	.			Bromoform
B09	TRCMEOL	PPB	10	2	2	***	.			Trichloromethanethiol
B10	TRCMFLM	PPB	10	2	2	***	.			Trichloromonofluoromethane
B11	TRCPANE	PPB	10	2	2	***	.			Trichloropropane
B12	123-trp	PPB	10	2	2	***	.			1,2,3-trichloropropane
B13	VINYIDE	PPB	10	2	2	***	1	EPAP		Vinyl chloride
B15	DIETHY	PPB	10	2	2	***	.			Diethyla-sine
B19	ACETILE	PPB	3000	2	2	***	.			Acetonitrile
B20	ACETOPH	PPB	10	2	2	***	.			Acetophenone
B21	WARFRIN	PPB	10	2	2	***	.			Warfarin
B22	ACEFENE	PPB	10	2	2	***	.			2-acetylaminofluorene
B23	AMINOYL	PPB	10	2	2	***	.			4-aminobyphenyl
B24	AMIISOX	PPB	10	2	2	***	.			5-(aminomethyl)-3-isoxazolol
B25	AMITROL	PPB	10	2	2	***	.			Amitrole
B26	ANILINE	PPB	10	2	2	***	.			Aniline
B27	ARAMITE	PPB	10	2	2	***	.			Aramite
B28	AURAMIN	PPB	10	2	2	***	.			Auramine
B29	BENZCAC	PPB	10	2	2	***	.			Benz[c]acridine
B30	BENZAAN	PPB	10	2	2	***	.			Benz[a]anthracene
B31	BENDICM	PPB	10	2	2	***	.			Benzene, dichloromethyl
B32	BENTHOL	PPB	10	2	2	***	.			Benzenethoil
B33	BENDINE	PPB	10	2	2	***	.			Benzidine
B34	BENZBFL	PPB	10	2	2	***	.			Benzo[b]fluoranthene
B35	BENZJFL	PPB	10	2	2	***	.			Benzo[j]fluoranthene
B36	PBENZQU	PPB	10	2	2	***	.			P benzoquinone
B37	BENZCHL	PPB	10	2	2	***	.			Benzyl chloride
B38	BIS2CHM	PPB	10	2	2	***	.			Bis(2-chloroethoxy) methane
B39	BIS2CHE	PPB	10	2	2	***	.			Bis(2-chloroethyl) ether
B40	BIS2EPH	PPB	10	2	2	***	.			Bis(2-ethylhexyl) phthalate

9 2 1 2 5 6 3 0 1 7 2

TABLE 3. (contd)

---Constituent List=WAC 173-303-9905---

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Regulatory Limits Limit	Agency	Exceed	Full name
B41	BROPHEN	PPB	10	2	2 ***	.			4-bromophenyl phenyl ether
B42	BUTBENP	PPB	10	2	2 ***	.			Butyl benzyl phthalate
B43	BUTDINP	PPB	10	2	2 ***	.			2-sec-butyl-4,6-dinitrophenol
B44	CHALETH	PPB	10	2	2 ***	.			Chloroalkyl ethers
B45	CHLANIL	PPB	10	2	2 ***	.			P-chloroaniline
B46	CHLCRES	PPB	10	2	2 ***	.			P-chloro-m-cresol
B47	CHLEPOX	PPB	10	2	2 ***	.			1-chloro-2,3-epoxypropane
B48	CHLNAPH	PPB	10	2	2 ***	.			2-chloronaphthalene
B49	CHLPHEN	PPB	10	2	2 ***	.			2-chlorophenol
B50	CHRYSEN	PPB	10	2	2 ***	.			Chrysene
B51	CRESOLS	PPB	10	2	2 ***	.			Cresols
B52	CYCHDIN	PPB	10	2	2 ***	.			2-cyclohexyl-4,6-dinitrophenol
B53	DIBAHAC	PPB	10	2	2 ***	.			Dibenz[a,h]acridine
B54	DIBAJAC	PPB	10	2	2 ***	.			Dibenz[a,j]acridine
B55	DIBAHAN	PPB	10	2	2 ***	.			Dibenz[a,h]anthracene
B56	DIBCGCA	PPB	10	2	2 ***	.			7H-dibenzo[c,g]carbazole
B57	DIBAEPY	PPB	10	2	2 ***	.			Dibenzo[a,e]pyrene
B58	DIBAHPY	PPB	10	2	2 ***	.			Dibenzo[a,h]pyrene
B59	DIBAIPY	PPB	10	2	2 ***	.			Dibenzo[a,i]pyrene
B60	DIBPHTH	PPB	10	2	2 ***	.			Di-n-butyl phthalate
B61	12-dben	PPB	10	2	2 ***	.			1,2-dichlorobenzene
B62	13-dben	PPB	10	2	2 ***	.			1,3-dichlorobenzene
B63	14-dben	PPB	10	2	2 ***	.			1,4-dichlorobenzene
B64	DICHBEN	PPB	10	2	2 ***	.			3,3'-dichlorobenzidine
B65	24-dchp	PPB	10	2	2 ***	.			2,4-dichlorophenol
B66	26-dchp	PPB	10	2	2 ***	.			2,6-dichlorophenol
B67	DIEPHTH	PPB	10	2	2 ***	.			Diethyl phthalate
B68	DIHYSAF	PPB	10	2	2 ***	.			Dihydrosafrole
B69	DIMETHB	PPB	10	2	2 ***	.			3,3'-dimethoxybenzidine
B70	DIMEAMB	PPB	10	2	2 ***	.			P-dimethylaminoazobenzene
B71	DIMBENZ	PPB	10	2	2 ***	.			7,12-dimethylbenz[a]anthracene
B72	DIMEYLB	PPB	10	2	2 ***	.			3,3'-dimethylbenzidine
B73	THIONOX	PPB	10	2	2 ***	.			Thiofanox
B74	DIMPHAM	PPB	10	2	2 ***	.			Alpha,alpha-dimethylphenethylamine
B75	DIMPHEN	PPB	10	2	2 ***	.			2,4-dimethylphenol
B76	DIMPHTH	PPB	10	2	2 ***	.			Dimethyl phthalate
B77	DINBENZ	PPB	10	2	2 ***	.			Dinitrobenzene
B78	DINCRES	PPB	10	2	2 ***	.			4,6-dinitro-o-cresol and salts
B79	DINPHEN	PPB	10	2	2 ***	.			2,4-dinitrophenol
B80	24-dint	PPB	10	2	2 ***	.			2,4-dinitrotoluene
B81	26-dint	PPB	10	2	2 ***	.			2,6-dinitrotoluene
B82	DIOPHTH	PPB	10	2	2 ***	.			Di-n-octyl phthalate
B83	DIPHAMI	PPB	10	2	2 ***	.			Diphenylamine
B84	DIPHHYD	PPB	10	2	2 ***	.			1,2-diphenylhydrazine
B85	DIPRNIT	PPB	10	2	2 ***	.			Di-n-propylnitrosamine
B86	ETHMINE	PPB	10	2	2 ***	.			Ethyleneimine
B87	ETHMETS	PPB	10	2	2 ***	.			Ethyl methanesulfonate
B88	FLUORAN	PPB	10	2	2 ***	.			Fluoranthene
B89	HEXCBEN	PPB	10	2	2 ***	.			Hexachlorobenzene
B90	HEXCBUT	PPB	10	2	2 ***	.			Hexachlorobutadiene
B91	HEXCCYC	PPB	10	2	2 ***	.			Hexachlorocyclopentadiene
B92	HEXCETH	PPB	10	2	2 ***	.			Hexachloroethane

TABLE 3. (contd)

Constituent List=WAC 173-303-9905

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection	Regulatory Limits Limit	Agency	Exceed	Full name
B93	INDENOP	PPB	10	2	2 •••	.			Indeno(1,2,3-cd)pyrene
B94	ISOSOLE	PPB	10	2	2 •••	.			Isosafrole
B95	MALOILE	PPB	10	2	2 •••	.			Malononitrile
B96	MELPHAL	PPB	10	2	2 •••	.			Melphalan
B97	METHAPY	PPB	10	2	2 •••	.			Methapyrilene
B98	METHNYL	PPB	10	2	2 •••	.			Metholonyl
B99	METAZIR	PPB	10	2	2 •••	.			2-methylaziridine
C01	METCHAN	PPB	10	2	2 •••	.			3-methylcholanthrene
C02	METBISC	PPB	10	2	2 •••	.			4,4'-methylenebis(2-chloroaniline)
C03	METACTO	PPB	10	2	2 •••	.			2-methyllactonitrile
C04	METACRY	PPB	10	2	2 •••	.			Methyl methacrylate
C05	METMSUL	PPB	10	2	2 •••	.			Methyl methanesulfonate
C06	METPROP	PPB	10	2	2 •••	.			2-methyl-2-(methylthio) propionaldehyde-
C07	METHIOU	PPB	10	2	2 •••	.			Methylthiouracil
C08	NAPHQUI	PPB	10	2	2 •••	.			1,4-naphthoquinone
C09	1-napha	PPB	10	2	2 •••	.			1-naphthylamine
C10	2-napha	PPB	10	2	2 •••	.			2-naphthylamine
C11	NITRANI	PPB	10	2	2 •••	.			P-nitroaniline
C12	NITBENZ	PPB	10	2	2 •••	.			Nitrobenzine
C13	NITPHEN	PPB	10	2	2 •••	.			4-nitrophenol
C14	NNIBUTY	PPB	10	2	2 •••	.			N-nitrosodi-n-butylamine
C15	NNIDIEA	PPB	10	2	2 •••	.			N-nitrosodiethanolamine
C16	NNIDIEY	PPB	10	2	2 •••	.			N-nitrosodiethylamine
C17	NNIDIME	PPB	10	2	2 •••	.			N-nitrosodimethylamine
C18	NNIMETH	PPB	10	2	2 •••	.			N-nitrosomethylethylamine
C19	NNIURET	PPB	10	2	2 •••	.			N-nitroso-N-methylurethane
C20	NNIVINY	PPB	10	2	2 •••	.			N-nitrosomethylvinylamine
C21	NNIMORP	PPB	10	2	2 •••	.			N-nitrosomorpholine
C22	NNINICO	PPB	10	2	2 •••	.			N-nitrosonornicotine
C23	NNIPIPE	PPB	10	2	2 •••	.			N-nitrosopiperidine
C24	NITRPYR	PPB	10	2	2 •••	.			Nitrosopyrrolidine
C25	NITRTOL	PPB	10	2	2 •••	.			5-nitro-o-toluidine
C26	PENTCHB	PPB	10	2	2 •••	.			Pentachlorobenzene
C27	PENTCHN	PPB	10	2	2 •••	.			Pentachloronitrobenzene
C28	PENTCHP	PPB	10	2	2 •••	220	EPAP		Pentachlorophenol
C29	PHENTIN	PPB	10	2	2 •••	220	EPAP		Phenacetin
C30	PHENIME	PPB	10	2	2 •••	.			Phenylenediamine
C31	PHTHEST	PPB	10	2	2 •••	.			Phthalic acid esters
C32	PICOLIN	PPB	10	2	2 •••	.			2-picoline
C33	PRONIDE	PPB	10	2	2 •••	.			Pronamide
C34	RESERPI	PPB	10	2	2 •••	.			Reserpine
C35	RESORCI	PPB	10	2	2 •••	.			Resorcinol
C36	SAFROL	PPB	10	2	2 •••	.			Safrol
C37	TETRCHB	PPB	10	2	2 •••	.			1,2,4,5-tetrachlorobenzene
C39	TETRCHP	PPB	10	2	2 •••	.			2,3,4,6-tetrachlorophenol
C40	THIURAM	PPB	10	2	2 •••	.			Thiuram
C41	TOLUDIA	PPB	10	2	2 •••	.			Toluenediamine
C42	OTOLHYD	PPB	10	2	2 •••	.			O-toluidine hydrochloride
C43	TRICHLB	PPB	10	2	2 •••	.			1,2,4-trichlorobenzene
C44	245-trp	PPB	10	2	2 •••	.			2,4,5-trichlorophenol
C45	246-trp	PPB	10	2	2 •••	.			2,4,6-trichlorophenol
C46	TRIPHOS	PPB	10	2	2 •••	.			O,O,O-triethyl phosphorothioate
C47	SYMTRIN	PPB	10	2	2 •••	.			Sym-trinitrobenzene

TABLE 3. (contd)

--Constituent List=WAC 173-303-9905--

Code	Constituent Name	Units	Detection Limit	Samples	Below Detection		Regulatory Limits Limit	Agency	Exceed	Full name
C48	TRISPHS	PPB	10	2	2	***	.			Tris(2,3-dibromopropyl) phosphate
C49	BENZOPY	PPB	10	2	2	***	.			Benzo[a]pyrene
C50	CHLNAPZ	PPB	10	2	2	***	.			Chlornaphazine
C51	BIS2ETH	PPB	10	2	2	***	.			Bis(2-chloroisopropyl)ether
C52	HEXAENE	PPB	10	2	2	***	.			Hexachloropropene
C53	HYDRAZI	PPB	3000	2	2	***	.			Hydrazine
C54	HEXACHL	PPB	10	2	2	***	.			Hexachlorophene
C55	NAPHTHA	PPB	10	2	2	***	.			Naphthalene
C56	123TRI	PPB	10	2	2	***	.			1,2,3-trichlorobenzene
C58	135TRI	PPB	10	2	2	***	.			1,3,5-trichlorobenzene
C59	1234TE	PPB	10	2	2	***	.			1,2,3,4-tetrachlorobenzene
C60	1235TE	PPB	10	2	2	***	.			1,2,3,5-tetrachlorobenzene
C61	TETEPYR	PPB	100	2	2	***	.			Tetraethylpyrophosphate
C62	CHLLATE	PPB	100	2	2	***	.			Chlorobenzilate
C63	CARBPHT	PPB	2	2	2	***	.			Carbophenothion
C64	DISULFO	PPB	2	2	2	***	.			Disulfoton
C65	DIMETHO	PPB	5	2	2	***	.			Dimethoate
C66	METHPAR	PPB	2	2	2	***	.			Methyl parathion
C67	PARATHI	PPB	2	2	2	***	.			Parathion
C70	CYANIDE	PPB	10	2	2	***	.			Cyanide
C71	FORMALN	PPB	500	2	2	***	.			Formalin
C77	PERCHLO	PPB	1000	2	2	***	.			Perchlorate
C79	KEROSEN	PPB	10000	2	2	***	.			Kerosene
C87	CITRUSR	PPB	1000	2	2	***	.			Citrus red
C88	CYANBRO	PPB	3000	2	2	***	.			Cyanogen bromide
C89	CYANCHL	PPB	3000	2	2	***	.			Cyanogen chloride
C90	PARALDE	PPB	3000	2	2	***	.			Paraldegyde
C91	STRYCHN	PPB	50	2	2	***	.			Strychnine
C92	MALHYDR	PPB	500	2	2	***	.			Maleic hydrizide
C93	NICOTIN	PPB	100	2	2	***	.			Nicotinic acid
C94	ACRYIDE	PPB	3000	2	2	***	0	EPAP		Acrylamide
C95	ALLYLAL	PPB	3000	2	2	***	.			Allyl alcohol
C96	CHLORAL	PPB	3000	2	2	***	.			Chloral
C97	CHLACET	PPB	3000	2	2	***	.			Chloroacetaldehyde
C98	CHLPROP	PPB	3000	2	2	***	.			3-chloropropionitrile
C99	CYANOGN	PPB	3000	2	2	***	.			Cyanogen
H01	DICPROP	PPB	3000	2	2	***	.			Dichloropropanol
H03	ETHCARB	PPB	3000	2	2	***	.			Ethyl carbamate
H04	ETHCYAN	PPB	3000	2	2	***	.			Ethyl cyanide
H05	ETHOXID	PPB	3000	2	2	***	.			Ethylene oxide
H06	ETHMETH	PPB	3000	2	2	***	.			Ethyl methacrylate
H07	FLUOROA	PPB	3000	2	2	***	.			Fluoroacetic acid
H08	GLYCIDY	PPB	3000	2	2	***	.			Glycidylaldehyde
H09	ISOBUTY	PPB	3000	2	2	***	.			Isobutyl alcohol
H10	METZINE	PPB	3000	2	2	***	.			Methyl hydrazine
H11	PROPYLA	PPB	3000	2	2	***	.			N-propylamine
H12	PROPYNO	PPB	3000	2	2	***	.			2-propyn-1-ol
H16	2,4,5-T	PPB	1	2	2	***	.			2,4,5-T
H40	FTHALLI	PPB	10	2	2	***	.			Thallium, filtered

*** - Indicates all samples were below detection limits
xxx - Indicates that regulatory limits were exceeded
EPA - based on limits given in 40CFR 265, Appendix III, EPA Interim Primary Drinking Water Standards
EPAP - based on proposed Maximum Contaminant Levels

more detail in the remainder of this section and are also shown on plots. The well numbers are denoted on these plots by the last part of the well name (e.g., 199-H4-3 = 3, 199-H4-12C = 12C).

A summary of all results obtained for samples collected from December 1986 through February 1987 is presented in Table 3. For those constituents that were undetected during this time period, three asterisks appear in the column labeled "Below Detection." Also, any constituent having at least one value above the regulatory standard or a screening limit are marked with three X's in the column labeled "Exceed." The raw analytical data for all constituents with at least one value above the detection limit are presented in Appendix C of Volume 3.

Figures 14, 15, and 16 show the levels of conductivity, sodium, and nitrate, respectively through the most recent sampling period. The significance of these data is that the concentrations in well 199-H4-3 are on the increase following a large decrease from a June high. As reported in the previous progress report (USDOE 1987), these trends can be related to fluctuations

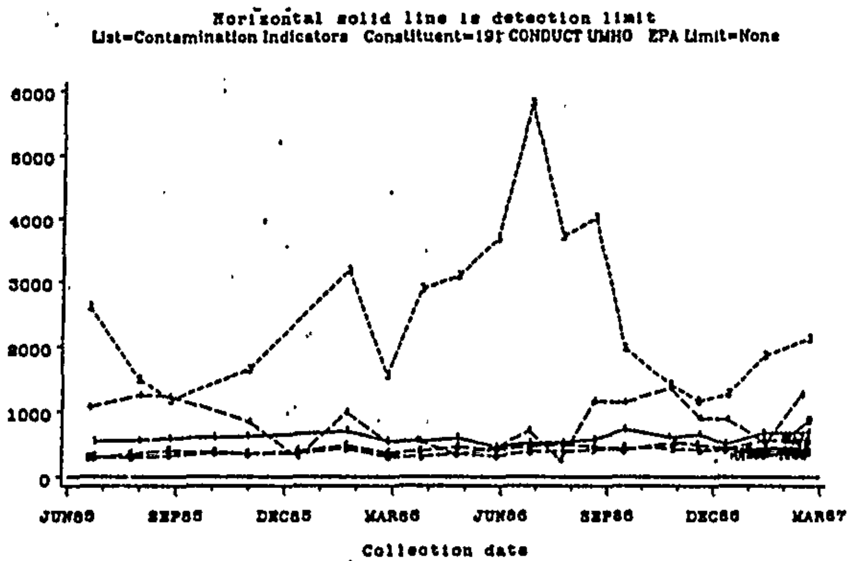

FIGURE 14. Conductivity Values in Samples from Monitoring Wells for the 183-H Solar Evaporation Basins, June 1985 Through February 1987

9212530176

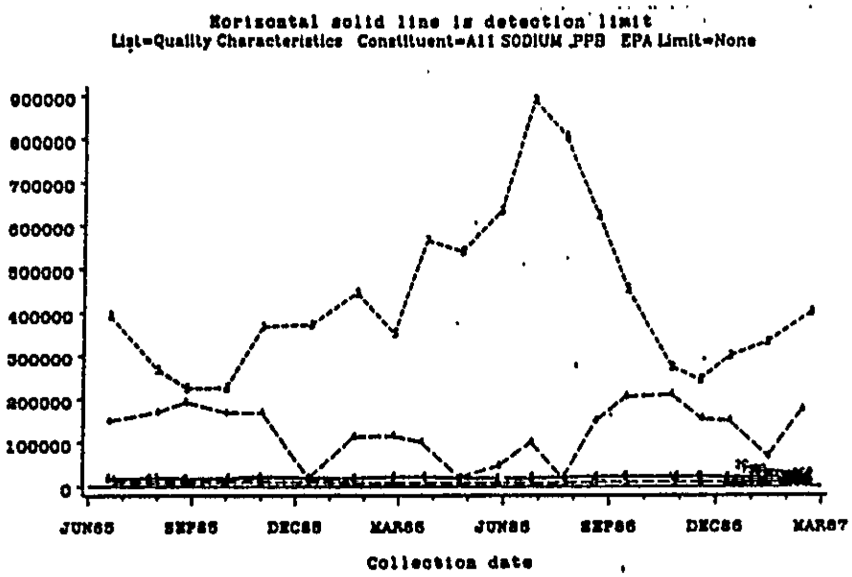

FIGURE 15. Sodium Concentrations in Samples from Monitoring Wells for the 183-H Solar Evaporation Basins, June 1985 Through February 1987

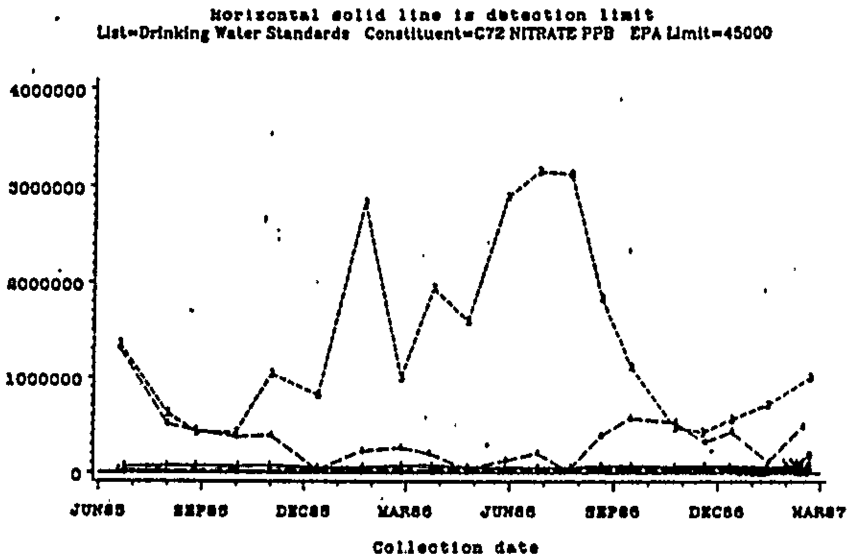

FIGURE 16. Nitrate Concentrations in Samples from Monitoring Wells for the 183-H Solar Evaporation Basins, June 1985 Through February 1987

in the water table elevation. Water table elevations in five of the monitoring wells are shown in Figure 17. These data indicate that periodic fluctuations in water levels occur and are related to river stage. Wells near the river (199-H4-3, 199-H4-4, and 199-H4-5) show larger fluctuations than those further from the river (199-H3-1 and 199-H4-6). The current increases in the subject parameters appear to be related to peak water levels in January. This trend should be better defined with additional monitoring data.

The spatial distribution of key parameter concentrations for January are presented in Figures 18 through 27. These figures were reviewed with the Washington State Department of Ecology representatives, Roger Stanley and Dennis Erikson, on March 30, 1987, as part of the decision process for Phase III drilling. The significance of these data is that distributions of gross alpha, gross beta, sodium, and nitrate (Figures 18 to 21) are vastly different in extent from chromium, sulfate, magnesium, potassium, calcium, and chloroform (Figures 22 to 27). Both State representatives agreed that the two parameter groups differed in their extent and indication of ground- water flow. The obvious question of the source of chromium and chloroform was raised.

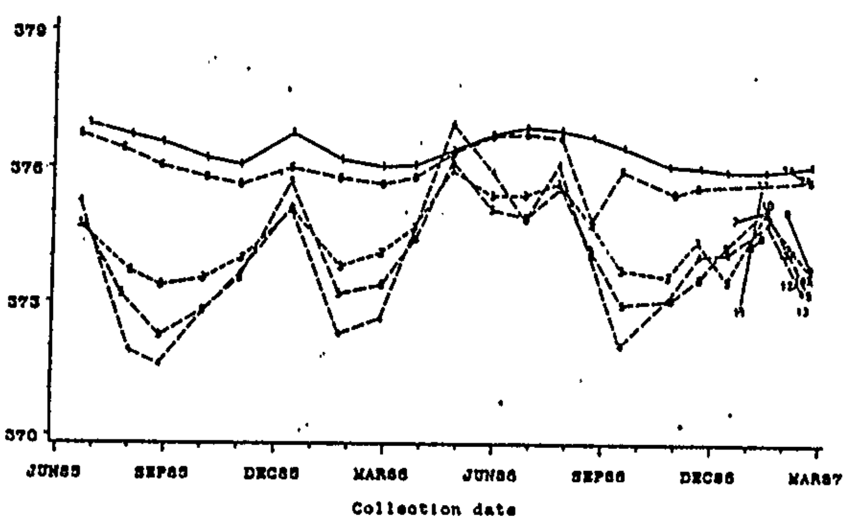

FIGURE 17. Water Table Elevations in Ft above MSL for Monitoring Wells for the 183-H Solar Evaporation Basins, June 1985 through February 1987

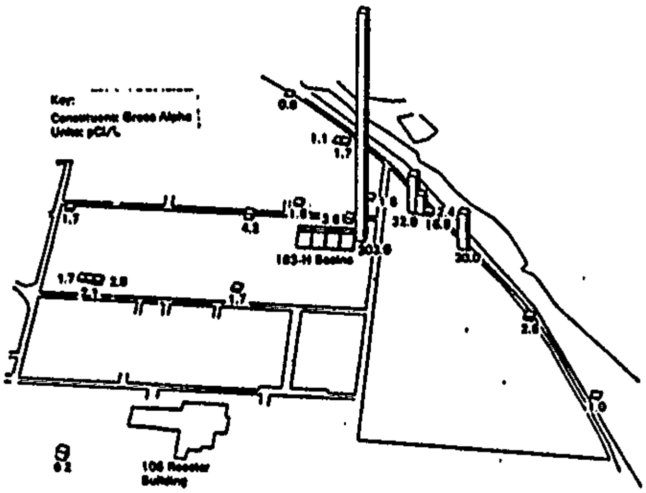

FIGURE 18. Spatial Distribution of Gross Alpha in the January 1987 Sample Set from Monitoring Wells Near the 183-H Solar Evaporation Basins

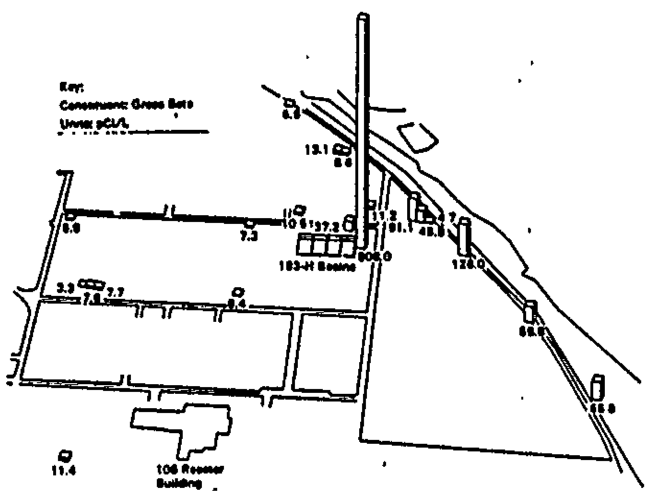

FIGURE 19. Spatial Distribution of Gross Beta Concentrations in the January 1987 Sample Set from Monitoring Wells Near the 183-H Solar Evaporation Basins

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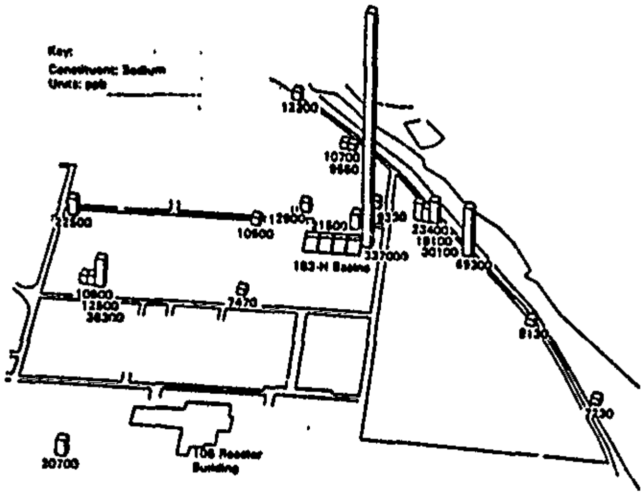

FIGURE 20. Spatial Distribution of Sodium Concentrations in the January 1987 Sample Set from Monitoring Wells Near the 183-H Solar Evaporation Basins

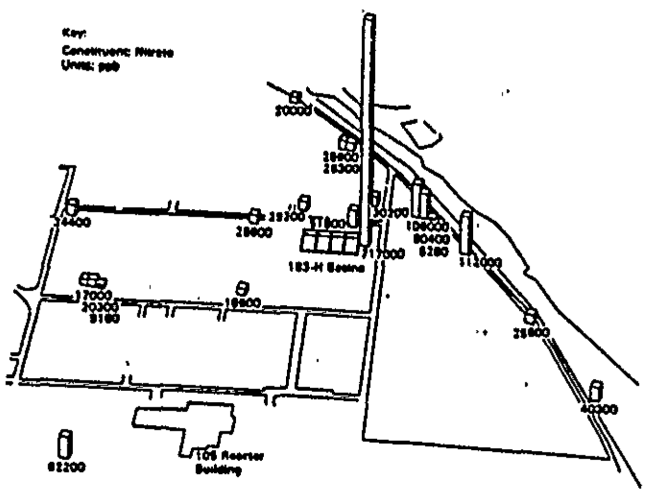

FIGURE 21. Spatial Distribution of Nitrate Concentrations in the January 1987 Sample Set from Monitoring Wells Near the 183-H Solar Evaporation Basins

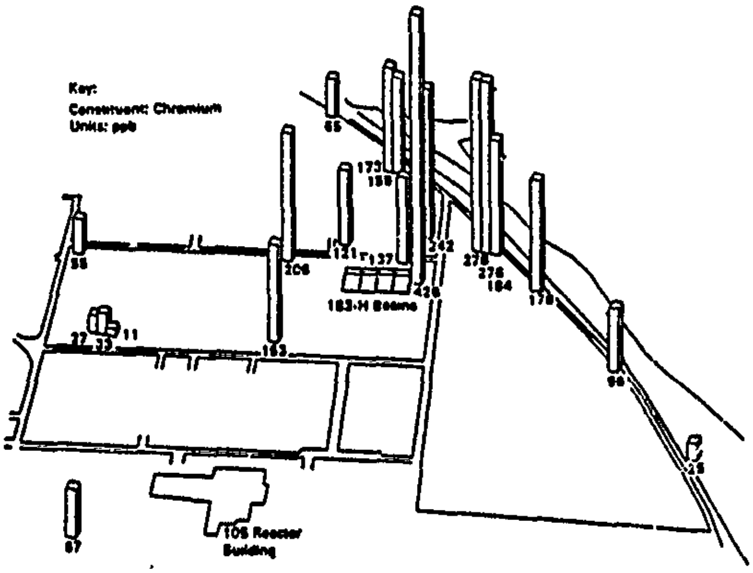

FIGURE 22. Spatial Distribution of Chromium Concentrations in the January 1987 Sample Set from Monitoring Wells Near the 183-H Solar Evaporation Basins

9212553 0180

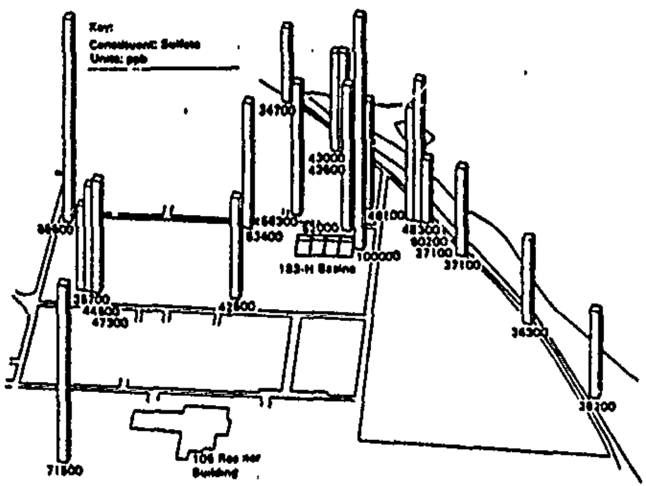

FIGURE 23. Spatial Distribution of Sulfate Concentrations in the January 1987 Sample Set from Monitoring Wells Near the 183-H Solar Evaporation Basins

92125630181

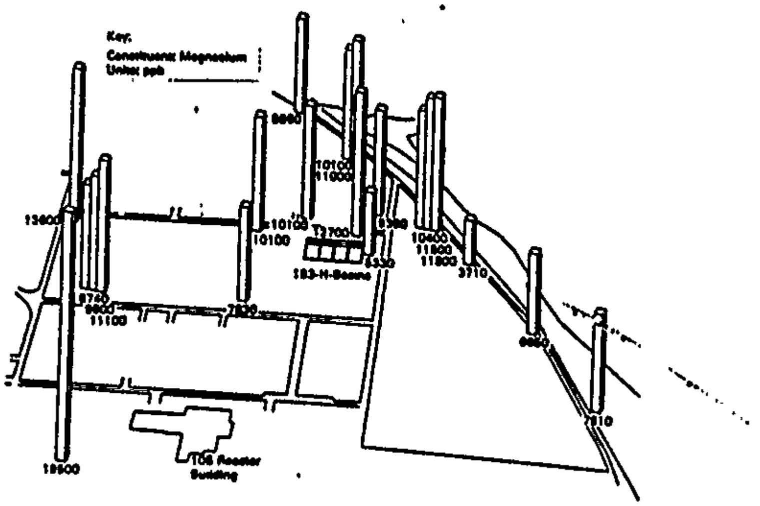

FIGURE 24. Spatial Distribution of Magnesium Concentrations in the January 1987 Sample Set from Monitoring Wells Near the 183-H Solar Evaporation Basins

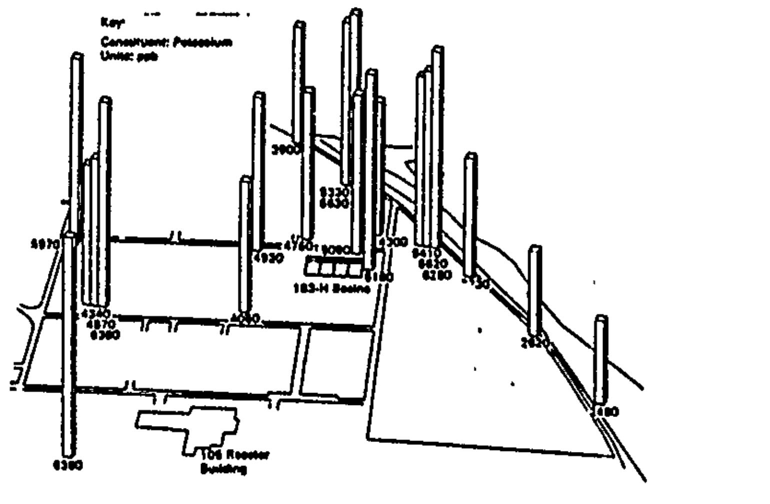

FIGURE 25. Spatial Distribution of Potassium Concentrations in the January 1987 Sample Set from Monitoring Wells Near the 183-H Solar Evaporation Basins

9212553013 2

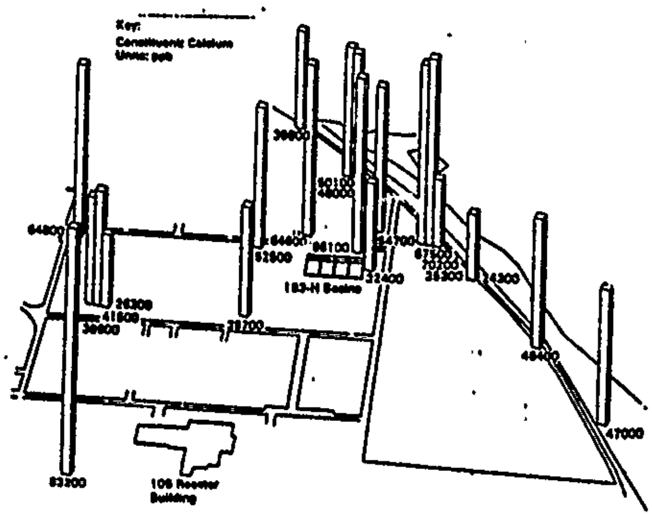

FIGURE 26. Spatial Distribution of Calcium Concentrations in the January 1987 Sample Set from Monitoring Wells Near the 183-H Solar Evaporation Basins

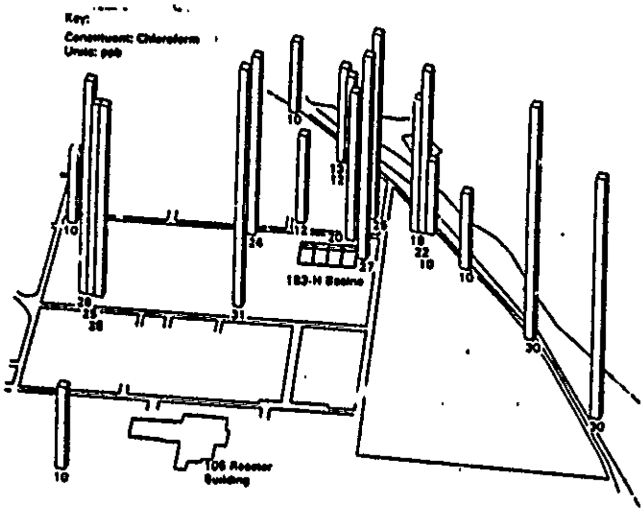

FIGURE 27. Spatial Distribution of Chloroform Concentrations in the January 1987 Sample Set from Monitoring Wells Near the 183-H Solar Evaporation Basins

Waste characterization information on CERCLA sites in the vicinity was reviewed. Waste inventories presented in Volume II of the "Draft Phase I Installation Assessment of Inactive Waste-Disposal Sites At Hanford" (USDOE 1986b) show that several previously used liquid waste disposal cribs containing up to 2000 kg of sodium dichromate are located in near proximity to the 183-H Basins. In light of these potential sources of chromium, the U.S. Department of Energy (USDOE) presented the idea that the chromium contamination is clearly more widespread than the plume-defining parameters such as nitrate, sodium, gross beta, and gross alpha and should be studied under ongoing RCRA Correction Action and CERCLA Remedial Action Programs. The representatives of the Washington State Department of Ecology agreed that the USDOE proposal was reasonable.

Phase III Site Assessment

Phase III drilling for the 183-H assessment will be focused in two areas: north of the basins in an area of suspected Ringold Formation high and to the south of the basins where there is a "hole" in the coverage. After discussions with the representatives of the Washington State Department of Ecology, three wells will be drilled in Phase III. The locations of these wells are shown in Figure 28. The strategy for completing these wells is to complete, test, sample, and perform gross alpha, gross beta, sodium, nitrate, and chromium analyses on a priority turn-around basis for well 199-H4-16 first. While the samples are being analyzed, well 199-H4-17 will be drilled. Lastly, depending on the results of the analyses from well 199-0H4-16, well 199-H4-18 may be drilled. The importance of two wells to the south of the basins is to ensure that the southern boundary of the 183-H contamination plume is bounded by a well inside and a well outside of the plume. If well 199-H4-16 is outside the plume, well 199-H4-18 would be needed only to further refine the southern extent of the plume. In this case, well 199-H4-18 would be drilled between the 183-H Basins and well 199-H4-16. If well 199-H4-16 is outside the plume and no further refinement of the plume's extent is required, well 199-H4-18 will not be drilled. These three wells will be shallow, water table wells.

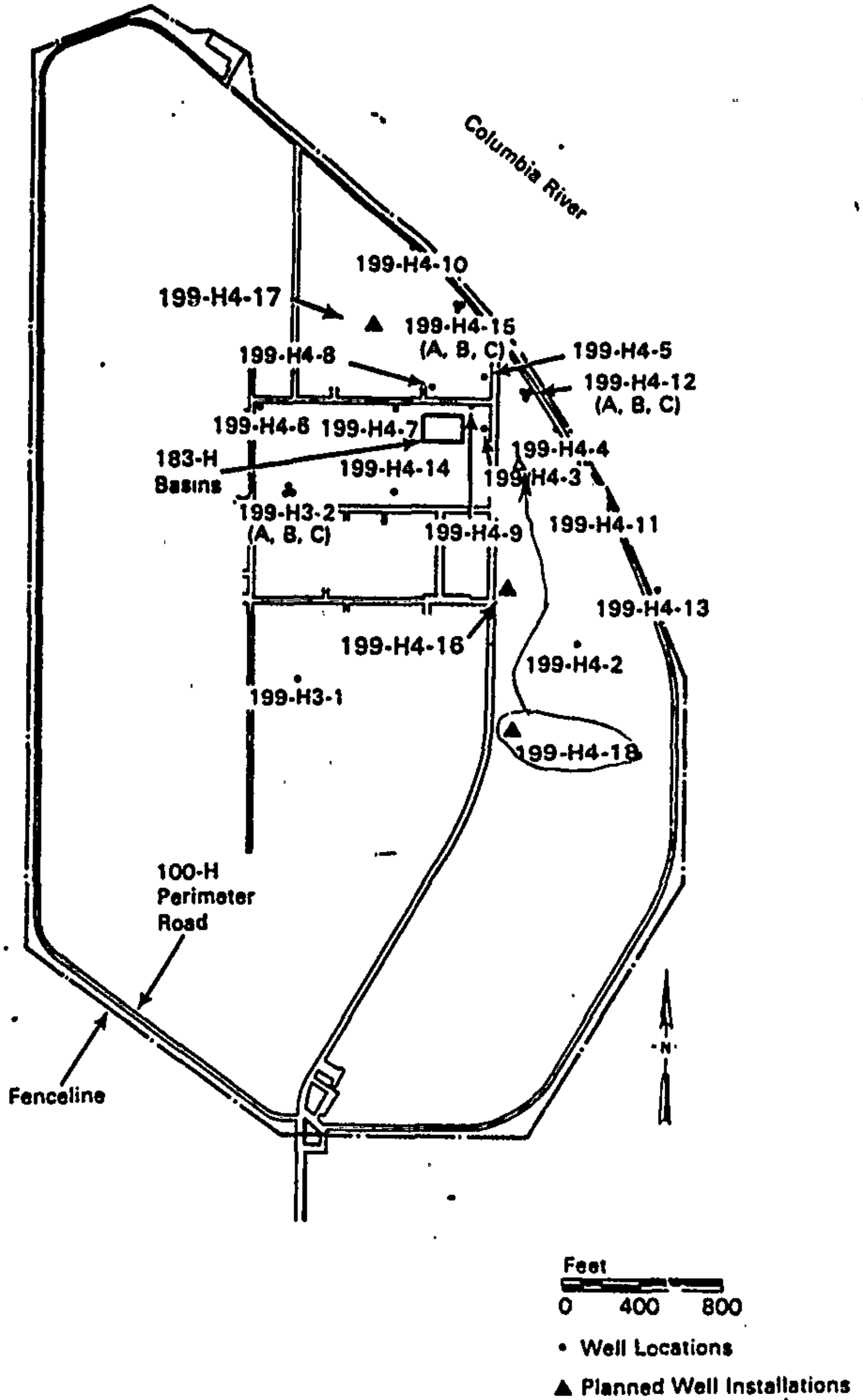

FIGURE 28. Locations of 100-H Area Phase III Monitoring Wells.

9 2 1 2 5 6 3 0 1 8 4

TABLE 4. Summary of Hydrologic Testing and Well Development Planned for Phase III Assessment of the 100-H Area

Well Name	Screened Interval (ft)	Formation	Height of Water Column	Developement of Well	Aquifer Testing
199-H3-2A	36-51	Uncon Seds	10	completed	completed
199-H3-2B	50-55	Uncon Seds	15	to be done	No
199-H3-2C	100-110	Ringold	70	to be done	to be done/limited
199-H4-7	38-53	Uncon Seds	10	completed	to be done
199-H4-8	38-48	Uncon Seds	4	to be done	to be done/limited
199-H4-9	36-46	Uncon Seds	3	to be done	to be done/limited
199-H4-10	23-38	Uncon Seds	10	completed	completed
199-H4-11	38-58	Uncon Seds	190	completed	completed
199-H4-12A	33-48	Uncon Seds	10	completed	completed
199-H4-12B	45-50	Uncon Seds	13	to be done	No
199-H4-12C	72-82	Ringold	46	to be done	to be done/limited
100-H4-13	37-52	Uncon Sed	10	to be done	to be done
199-H4-14	38-53	Uncon Seds	10	completed	completed
199-H4-15A	27-42	Uncon Seds	10	completed	completed
199-H4-15B	37-42	Uncon Seds	12	to be done	No
199-H4-15(S)	78-80	Ringold	50	to be done	to be done/limited
199-H4-15(R)	194-196	Ringold	160	to be done	to be done/limited
199-H4-15(Q)	295-297	Ringold	293	to be done	to be done/limited
199-H4-15(P)	325-327	Ringold	327	to be done	to be done/limited

Additional hydrologic testing and well development of Phase II wells will be conducted during Phase III. Specific work to be conducted is presented in Table 4. Wells that are within a few tens of feet of wells that have been previously tested will not undergo aquifer testing. Wells that will not be tested for this reason are 199-H3-2B, 199-H4-12B, and 199-H4-15B. Aquifer testing in the Ringold Formation has not been performed thus far. Testing methodology will be altered to accommodate the low transmissivity conditions expected. Slug testing of low permeability zones will not be conducted at this time so that the chemical integrity of any water samples can be preserved.

200 AREA LOW-LEVEL BURIAL GROUND

During the previous quarter, work centered around completion and delivery of the Compliance Plan. The plan was delivered to the Washington Department of Ecology and the USEPA on January 30, 1987.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

Drilling specifications, prepared and reviewed during the previous quarter, were sent out for bids. A single bid was received for the 200-West Area drilling and no bids were received for the 200-East Area drilling. Award of the 200-West Area contract is awaiting final contract review by the USDOE.

The 200-East Area contract has been subdivided into four smaller contracts to enable smaller drilling contractors (with limited bonding capacity) to participate in the bidding. The bids will be opened sequentially starting April 10, 1987. Delays in awarding the drilling contracts are impacting the ability to perform the work within the Consent Agreement Milestones.

Numerical modeling of the hydrogeologic system underlying the 200 Areas has continued during this quarter. Emphasis has been placed on the long- and short-term effects of liquid waste disposal on the placement and operation of the monitoring system planned. Based on this modeling effort, the depths of the wells to be drilled in the 200-East Area have been standardized at the top of basalt.

ROUTINE SAMPLING AND ANALYSIS OF THE GROUND WATER

No samples were collected during the quarter.

NONRADIOACTIVE DANGEROUS WASTE LANDFILL

Activities conducted in this reporting period include completion of hydrogeologic characterization, as-built drawings, lithologic logs, geophysical logs, sediment analyses (particle size and hydraulic properties), installation of pumps in two additional deep monitoring wells, and quarterly ground-water sample collection and analysis in five shallow and two deep monitoring wells. A draft of the interim characterization report is currently receiving internal review.

DRILLING AND HYDROGEOLOGIC CHARACTERIZATION

Drilling at the NRDW Landfill was completed in the previous quarter (see USDOE 1987) with final monitoring well completion occurring on January 5, 1987, of this reporting period. Final well completion involved surface grout work, installation of a protective casing, and addition of locking well caps. All sample pumps were installed by January 13, 1987. The locations of all wells considered part of the NRDW Landfill project are shown in Figure 29.

Well Drilling Effort

Well drilling was completed in the previous quarter; however, sediment analyses, lithologic logs and well construction summaries, and geophysical logs have been completed and are compiled in this report in Appendices D through F of Volume 3.

Hydrogeologic Characterization Effort

Sediment samples collected from previous well drilling were analyzed for grain size, calcium carbonate content, and moisture content. These data are reported in Appendix D. The sediments above the water table are generally dry, 3-to-8% moisture (on a dry weight basis) with only a few thin (0.5 to 1 in. thick) lenses exceeding 20% moisture (see Appendix D of Volume 3).

Sediment samples collected using a split-spoon sampler were sent to Shannon and Wilson, Inc., for the following analyses: 1) whole sample density, 2) a constant head permeability test on an undisturbed sample, 3) a one-point

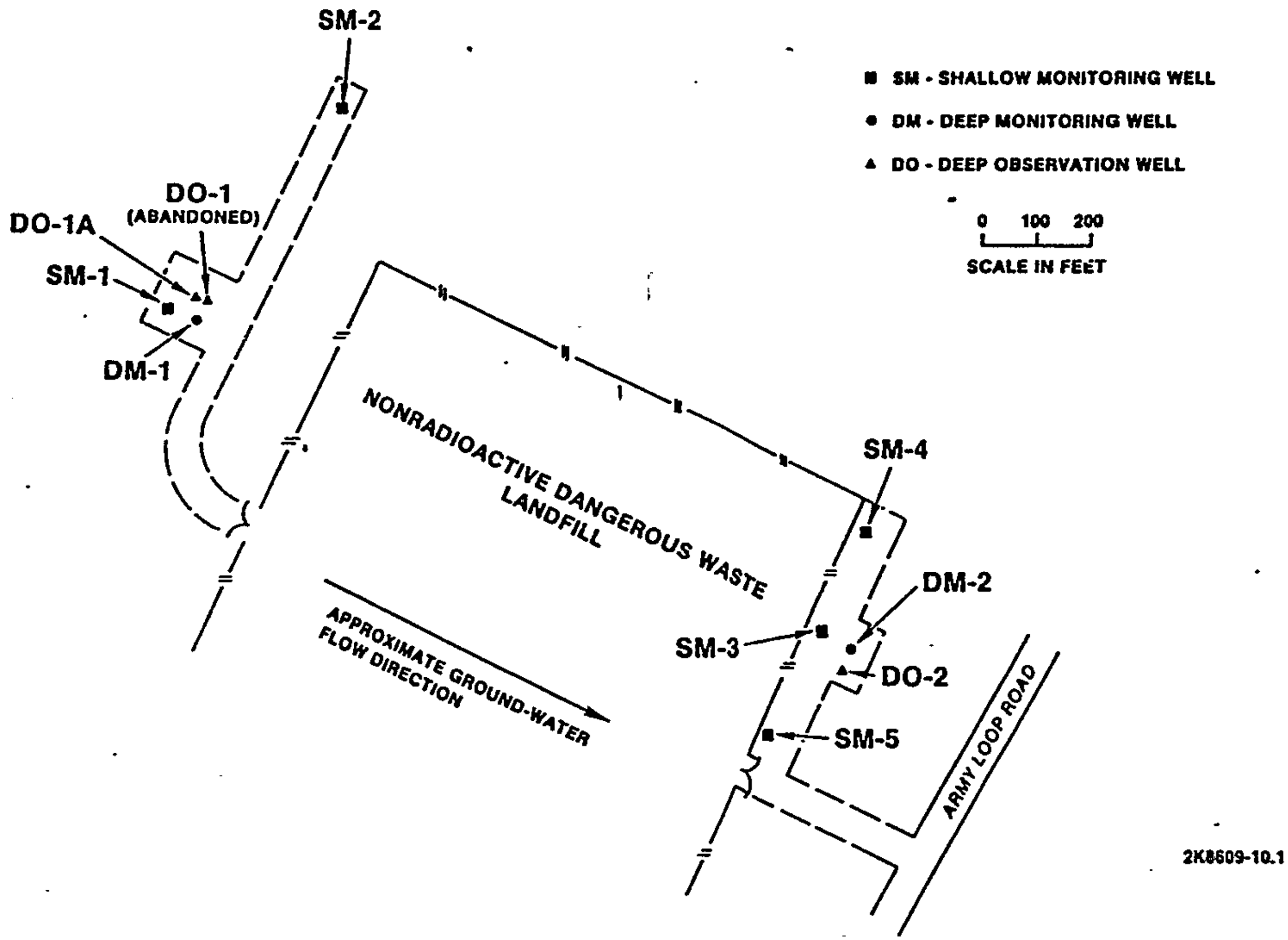

FIGURE 29. Location of NRDW Landfill Monitoring Wells

Atterburg limit, 4) sample description, 5) washed sieve analysis, and 6) hydrometer particle size analysis. These results are also presented in Appendix D of Volume 3.

Aquifer testing was completed in the previous quarter but insufficient time prevented inclusion of the results in the quarterly report. The results from the testing are presented in Appendix G of Volume 3.

Water level data were collected in all NRDW Landfill monitoring wells during the quarter. These data and additional previously collected but unreported regional data are presented in Appendix H of Volume 3.

The hydrogeologic characterization identified four hydrostratigraphic units in the aquifer beneath the NRDW Landfill. These units are, in descending order: the saturated portion of the Hanford formation, the upper portion of the upper Ringold Formation, a laterally continuous sequence of low-permeability sediments, and the lower portion of the upper Ringold and the middle Ringold units extending to the bottom of the aquifer.

Sediments of the Hanford formation comprise the upper 60 ft of the aquifer, to a depth of 185 ft (340 ft MSL). This portion of the aquifer is unconfined and highly transmissive. Hydraulic properties were evaluated from an aquifer test conducted by pumping well DM-1. The transmissivity values calculated from aquifer test DM-1A range from approximately 100,000 to 300,000 ft^2/day. The average hydraulic conductivity of this upper portion of the aquifer ranges from approximately 1700 to 5000 ft/day, based on a saturated thickness of 60 ft. The storativity values range from about 0.001 to about 0.06, indicating the unconfined nature of the aquifer. The results of aquifer test analyses are summarized in Table G-1. The data and analyses for all aquifer tests are presented in Appendix G of Volume 3.

The aquifer test design and schedule constraints prohibited conducting an aquifer test on the upper portion of the Hanford formation, which would provide an estimate of the horizontal to vertical anisotropy ratio.

Sediments of the upper unit of the Ringold Formation underlie those of the Hanford formation, occurring between the depth of about 185 and 220 ft (340 to 305 ft MSL). Aquifer characteristics vary considerably within the upper

Ringold unit. The uppermost portion of the upper Ringold unit (a silty sand unit) occurs at a depth between about 185 and 200 ft (340 to 325 ft MSL). This unit was screened in well DM-1 and tested to determine hydraulic properties (test DM-1B) (see Appendix G of Volume 3). The transmissivity of this interval ranges from approximately 2000 to 3000 ft^2/day, and the average hydraulic conductivity for this interval ranges from approximately 130 to 200 ft/day, based on a thickness of 15 ft.

A zone of low-permeability sediments [the low-permeability unit (LPU)] occurs within the upper Ringold unit between the depths of about 200 and 213 ft (325 to 312 ft MSL) on the west side of the Landfill, and between about 200 and 208 ft (325 to 317 ft MSL) on the east side. These sediments consist of gravelly sandy clayey silt to silty sand. The least-permeable materials within the LPU have a vertical hydraulic conductivity of approximately 2 x 10^{-3} ft/day on the east side, and approximately 3 x 10^{-4} ft/day on the west side of the Landfill. These values were calculated from laboratory analyses conducted on samples collected from this zone (Appendix D of Volume 3). The geologic data suggest that this interval may have up to 10 ft of sediments exhibiting hydraulic conductivity values this low on the west side of the Landfill; whereas this interval may consist of only about 1 to 2 ft of sediments with hydraulic conductivity values this low on the east side.

The continuity and properties of the LPU were also evaluated by an aquifer test conducted beneath this zone (see Appendix G of Volume 3). The results of this aquifer test, performed by pumping from well DM-2 (test DM-2), indicate that the LPU is an effective confining bed that is continuous across the NRDW Landfill. Observation well responses were analyzed to estimate vertical hydraulic conductivity across this zone. The vertical hydraulic conductivity estimate ranges from approximately 1 x 10^{-2} to 2 x 10^{-2} ft/day on the west side of the Landfill (assuming a thickness of 10 ft), and is approximately 6 x 10^{-2} ft/day on the east side (assuming a thickness of 2 ft). These values only represent a maximum, average value for the entire assumed thickness of the LPU. Other factors may have contributed to the leakage-type response curves, resulting in a higher-than-actual value for vertical hydraulic conductivity.

Geologic, hydrologic, and laboratory test data confirm that the unit acts as the base of the aquifer for the purpose of monitoring potential vertical migration of contaminants.

Sediments of the upper Ringold unit extend below the LPU to a depth of about 220 ft (305 ft MSL). This interval, along with the upper portion of the middle Ringold unit, was tested during aquifer test DM-2 (See Appendix G of Volume 3). The transmissivity of this interval ranges from approximately 40 ft^2/day on the east side of the Landfill to between 500 and 2300 ft^2/day on the west side of the Landfill. The thickness of this portion of the aquifer is assumed to be about 50 ft for estimating hydraulic conductivity. Therefore, the hydraulic conductivity ranges from approximately 1 ft/day on the east side of the Landfill to between 10 and 50 ft/day on the west side. These values indicate a high degree of aquifer heterogeneity below the LPU.

The storativity of the interval below the low-permeability zone ranges from approximately 1×10^{-4} on the west side to approximately 4×10^{-4} on the east side. These values confirm the confined nature of this portion of the aquifer (if only locally), and the confining and continuous nature of the LPU.

The magnitude of the horizontal hydraulic gradient was determined to be about 1×10^{-4} ft/ft. Ground water was found to flow generally from west to east across the site. Ground-water flow in the vertical direction was estimated to be lateral (no vertical gradient). Because of the very slight gradient across the site, the calculated direction of ground-water flow was found to be extremely sensitive to measurement of water level elevation in wells. Uncertainties in the measurement of water levels may affect the measurements by as much as 0.10 ft. Therefore, additional work is recommended to determine the exact ground-water flow direction.

ROUTINE SAMPLING AND ANALYSIS OF THE GROUND WATER

The shallow wells were sampled in October 1986 and January 1987. The deep wells were first sampled in January 1987. All samples to date have been taken from the electric submersible purging pumps. Ground-water chemistry data collected to date are presented in Appendix I of Volume 3.

A preliminary comparison of the upgradient and downgradient well data indicates that the NRDW Landfill does not impact the ground water. Interim primary drinking water standards were compared with the analytical results and no constituent was found to exceed the standards.

Recommendations for continued work include the following:

- Continue monitoring the wells under interim-status requirements.
- Test and re-install bladder sampling pumps and begin sample collection from these pumps.
- Run borehole-deviation logs in all the wells to evaluate the deviation from vertical. Thereafter, correct water level elevations to compensate for the deviations.
- Place access tubes or install a dedicated system to provide accurate and precise water level measurements.
- Perform additional detailed analyses of diurnal fluctuations, and correct the water level elevations when possible.
- Conduct at least one tracer test by injecting a tracer in well SM-1 and sampling all the other monitoring wells. This test should provide information on ground-water flow direction and velocity.
- Collect water chemistry samples from the lower piezometer in DO-1A to compare water chemistry below the LPU in order to evaluate possible vertical communication across the LPU.

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